# SVS TOOL
# USER GUIDE

Sustainable Vegetable Systems

# SVS Tool User Guide

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Changes since previous version (1.2):

- Updates to descriptions to reflect the movement of the fertiliser input field into the model outputs section of the tool dashboard, as well as model updates to fertiliser scheduling
- New screenshots to reflect user interface updates
- Descriptions of new features, including the 'Share' button and new functionality for the fertiliser inputs section
- Addition of new soil sampling resources & reformatting in Section 8
- Removal of the tool updates section (Section 7.3) and edits to troubleshooting (7.2).

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This User Guide has been prepared by Sarah Dobson and Andrew Barber of Agrilink NZ, with contributions from the wider Sustainable Vegetable Systems project team. The primary purpose of this Guide is to support users of the SVS Tool, www.svstool.co.nz. The SVS Tool is the main output from the Sustainable Vegetable Systems project.

**Disclaimer**

The Sustainable Vegetable Systems (SVS) web tool provided on website above (the SVS Tool) has been developed by a partnership comprising the Ministry of Primary Industries (MPI), The New Zealand Institute for Plant and Food Research (PFR), Potatoes New Zealand Incorporated (PNZ), Horticulture New Zealand Incorporated (HortNZ), and the Vegetable Research and Innovation Board (representing Onions New Zealand Incorporated, Vegetables New Zealand Incorporated, Process Vegetables NZ and the New Zealand Buttercup Squash Council) (together the SVS Partners).

The SVS Tool has been designed to provide users with insight about nitrogen flows through a nitrogen budget, and guidance on nitrogen fertiliser application.

Use of the SVS Tool is voluntary and the user should exercise their own discretion before deciding to use it.

Use of the SVS Tool is at the sole risk of the user and none of the SVS Partners provide any warranty or assurance in relation to the accuracy of, or fitness for any particular use or application of, any information or scientific or other result contained in the SVS Tool.

To the maximum extent permitted at law, the SVS Partners shall not be liable for any cost (including legal costs), claim, liability, loss, damage, injury, or the like, which may be suffered or incurred as a direct or indirect result of the reliance by any person on any information contained in the SVS Tool.

# Contents

# 1 Introduction

## 1.1 Background to the SVS Tool

Sustainable Vegetable Systems (SVS) was a four-year industry and government funded project, focused on improving crop nutrient management and environmental outcomes for intensive vegetable production. The main project output is the SVS Tool, a decision-support tool to help improve understanding of crop nitrogen (N) dynamics, improve fertiliser use efficiency, and reduce environmental impacts.

The model that forms the basis of the SVS Tool has been built on scientific research trials conducted around New Zealand by Plant and Food Research, as well as research from published literature, including international studies. Grower data, collected from nine commercial properties in Pukekohe, Waikato, Hawke's Bay, Horowhenua, and Canterbury was used to validate model outputs. This means that the SVS Tool has been developed to help deal with the specific conditions growers face across New Zealand.

SVS was funded by the Ministry for Primary Industries (MPI), Potatoes NZ, Horticulture New Zealand, and product groups Onions NZ, Vegetables NZ, Process Vegetables NZ, and NZ Buttercup Squash, under the umbrella of the Vegetable Research and Innovation (VR&I) Board. Plant & Food Research is the research and model development partner. Rezare developed the user interface. Agrilink NZ provided project management, site monitoring, tool development and testing, and dissemination.

More information about the SVS project can be found here: https://www.vri.org.nz/environmental-resources/.

## 1.2 Purpose of user guide

The purpose of this user guide is to describe how to effectively use and understand the SVS Tool. The different components of the tool are explained to help users understand what they're seeing while interacting with the tool. This guide will be updated as features are adjusted or added to ensure it remains relevant and useful. We have also included additional information in the guide about N cycles (next section) and soil N testing to assist users that require more background information on soil nitrogen dynamics. Reference information, including crop coefficient data used to build the model, is available in Appendices 1 and 2.

We always welcome your feedback: andrew@agrilink.co.nz.

## 1.3 Navigating the user guide

The tool has been developed with three levels. At the 'Basic' level, the user needs just 4 inputs to produce an N budget, including fertiliser guidance. The 'Soil N Tests' and 'Crop Rotation' levels allow the user to fine tune the tool to their specific circumstances and allows measured numbers (soil tests) to overwrite the model. Measured numbers beat modelled numbers every time. It is when exploring these higher levels, the power of the tool comes into its own and transfers it into a powerful knowledge tool for optimised N management.

| Section | Content |
|---|---|
| 2 SVS Tool overview and structure | Layout of tool and dashboard, tool levels, crop reference table, key features, and managing crops/enterprises. |
| 3 Getting started with the tool | **Start here to use the tool now!** |
| 4 Understanding the model outputs | Interpreting the main tool outputs, including N guidance and graphs (when used in Basic level). |
| 5 Level: Soil N Tests | Using the tool in Soil N Tests level + impacts on model outputs |
| 6 Level: Crop Rotation | Using the tool in Crop Rotation level + impacts on model outputs |
| 7 FAQs & troubleshooting | Answers to questions we think you might have, and what to do if issues arise. |
| 8 Resources | A collection of resources developed during the project and information on N dynamics in vegetable crops. |
| Appendix 1 | Table of all crops available to model in the tool. |
| Appendix 2 | Crop coefficients used to build the model. |

## 1.4 Nitrogen overview

The tool focuses on modelling crop N balance scenarios. That means an understanding of the different components of the N cycle is useful prior to getting started.

### Importance of nitrogen

Nitrogen is one of the primary macronutrients utilised by plants. It is used to assist the production of amino acids and chlorophyll, which help plants to convert sunlight energy, carbon dioxide, and oxygen, into sugars. Nitrogen is often a main limiting factor for crop growth. Insufficient availability of N for plant uptake leads to reduced crop yield and, in some cases, total crop failure.

Nitrogen, specifically in the form of nitrate, can have adverse effects on the environment and human health when levels become elevated in waterways, freshwater bodies, and other drinking water sources such as aquifers. Nitrate is highly soluble and does not form strong attachments to soil surfaces, resulting in a tendency to fluctuate rapidly in quantity within the soil over short timeframes, unlike other nutrients that typically increase or decrease at a much slower rate. The movement of nitrate through the soil is referred to as nitrate leaching.

Therefore, growers must balance their N applications in a way that both maximises crop N uptake and reduces the risk of N loss to the environment. Accounting for current and predicted future levels of soil N, using tools such as the SVS Tool, can help growers achieve this.

### Forms of soil nitrogen

Soil N can broadly be divided into two main fractions – mineral N and organic N.

**Mineral N**

- Nitrogen in the soil at the time of sampling that is immediately available for crop uptake.[1] Mineral forms of N make up only 2–3% of the total soil N.[2]
- Mineral N can be found as nitrate or ammonium in soil. Soil labs will report results as nitrate, ammonium, and total mineral N.[1]
- Nitrate is usually the dominant form of nitrogen making up mineral N. However, this may not be the case where soils are exposed to prolonged periods of waterlogging, or urea or ammonium-based fertilisers have been applied[3].

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[1] Beare M. September 2022. Factsheet: Guidelines for soil nitrogen testing and predicting soil nitrogen supply. Version 1.1. The New Zealand Institute for Plant & Food Research.
[2] Mathers D, Norris M, Hunt A, Dellow S, Liu J, Trolove S. n.d. The Nitrate Quick Test mass balance tool: User guide. Foundation for Arable Research (FAR).
[3] Norris M, Beare MH, Curtin D, Trolove SN, Dellow S. Soil testing for informing nitrogen management in New Zealand cropping systems. https://flrc.massey.ac.nz/workshops/24/Manuscripts/Norris_Matt.pdf.

- Applied fertilisers containing N in the form of nitrate or ammonium are therefore part of the mineral N pool and are immediately available for uptake. Urea must first be converted from urea into ammonium, and then nitrate, before becoming plant available.

**Organic N**

- This is the largest fraction of N in the soil. Organic N is part of soil organic matter and unavailable for immediate crop uptake.
- Soil microbes can break down organic matter including crop residues to release N into the plant-available N pool. This process of organic matter breakdown and release of mineral N is called *mineralisation*.
- The portion of N accessible for breakdown by soil microbes is known as *mineralisable N*. The N then released from organic matter is known as *mineralised N*.[4]

Figure 1 shows how these different soil N fractions interact in the soil profile.

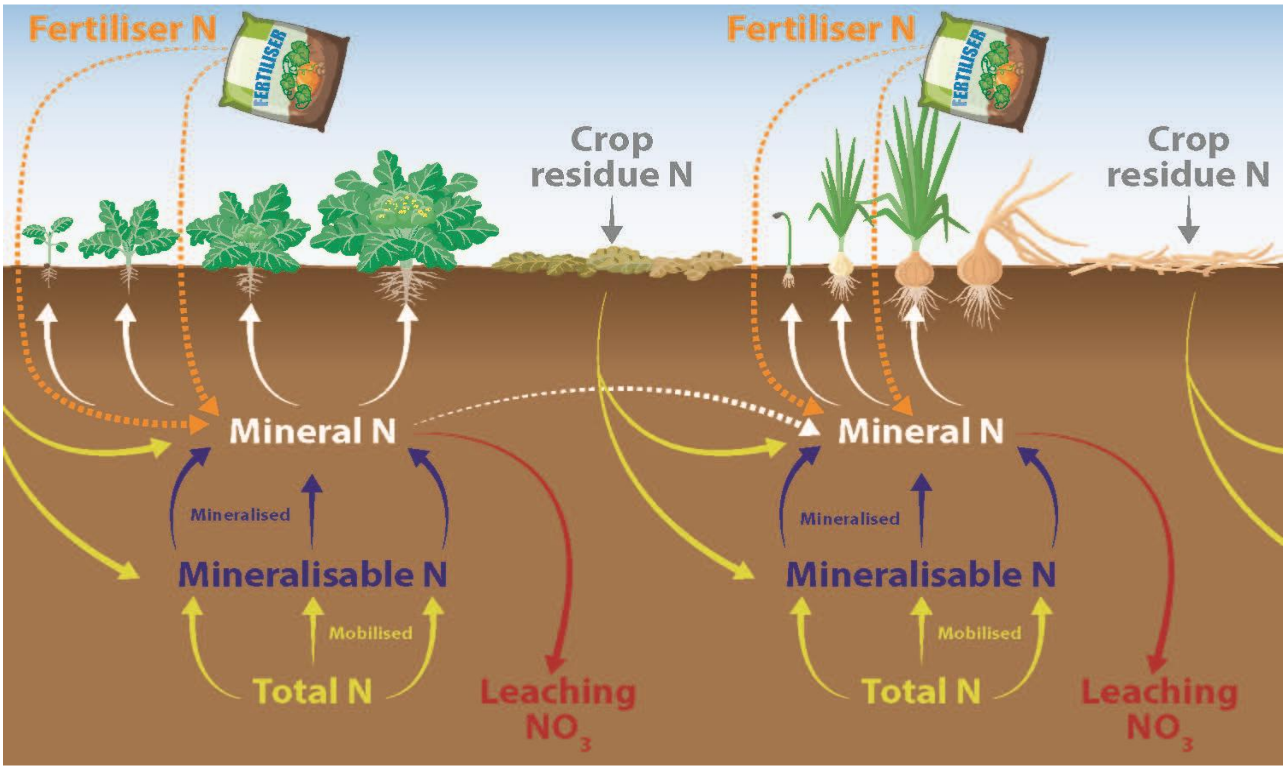



**Figure 1**. The forms of nitrogen in a cropping system, including total N, mineralisable N, mineral N, crop residue N, fertiliser N, and leaching (nitrate). Diagram developed by Plant & Food Research.

[4] Beare, M. September 2022. Factsheet: Guidelines for soil nitrogen testing and predicting soil nitrogen supply. Version 1.1. The New Zealand Institute for Plant & Food Research.

## Soil nitrogen processes

Many processes occur in the soil that will influence the levels of N available to plants.

**Pathways that increase soil mineral N**

- Mineralisation: The conversion of mineralisable N into mineral, plant available N by soil microbes, from the breakdown of organic matter.
- Fertiliser: Application of mineral N through fertiliser to supply crops with sufficient N.
- Residue breakdown: Residues from prior crops are broken down by soil microbes, increasing the soil organic N pool, and also providing direct release of mineral N as residues are mineralised.

**Pathways that decrease soil mineral N**

- Crop uptake: Nitrate and ammonium taken up by plants.
- Immobilisation: The reverse of mineralisation, when N is taken up by soil microbes, usually when a high C:N residue (e.g. wheat straw) is added to the system.
- Denitrification: The conversion of nitrate to nitrogen gas and nitrogen oxides, which are lost to the atmosphere.
- Volatilisation: The conversion of ammonium to ammonia gas, which is lost to the atmosphere.
- Leaching: The movement of nitrate down the soil profile to below the root zone due to excess drainage of water and is eventually lost to groundwater.

A note on soil N testing, located further on in this guide, provides an overview of soil N testing and what tests should be ordered for what purposes. More resources are available at the end of this document in 8 Resources.

# 2 SVS Tool overview and structure

This section will provide you with an overview of the tool, how it is structured, and the different inputs (crops) that can be modelled in the tool. If you'd just like to get started using the tool, please jump to 3 Getting started with the tool.

## 2.1 Overview

The SVS Tool has been created to allow users to model dynamic nitrogen (N) flows for a range of vegetable and arable crops, across multiple cropping seasons and rotations. The tool is setup to support decision making throughout the season, not just at the start or end.

The website (www.svstool.co.nz) has two main windows to navigate between:

**1) Tool dashboard**

The SVS Tool dashboard is where you will be spending the majority of your time – entering in crop, soil and fertiliser information, and looking at the model outputs.

**2) Manage enterprises & crops dashboard**

The Manage enterprise & crops dashboard is where you can set up different enterprises (e.g. different farms), paddocks, and crop rotations on each paddock. Depending on how much information you input, this will become your own mini farm dashboard, where you can manage different crop rotations to model and monitor N flows throughout the season.

## 2.2 Tool dashboard

The SVS Tool dashboard is split into four main sections, which include crop information (inputs), soil tests and environment (inputs), nitrogen fertiliser schedule (inputs), and model outputs.

The information entered into the inputs sections (crop information, soil, environment, and nitrogen fertiliser schedule) will determine what is displayed in the Model Outputs section. Figure 2 shows the layout of these three sections, as well as the key menus and buttons that will allow you to:

- Switch between crop scenarios while in the tool dashboard
- Change the level of the tool (discussed in 2.3 Tool structure and levels)
- Return to the 'Manage enterprises & crops' dashboard
- Add a comment to a crop scenario
- Download your model outputs (PDF or CSV file)
- Seed feedback about the tool

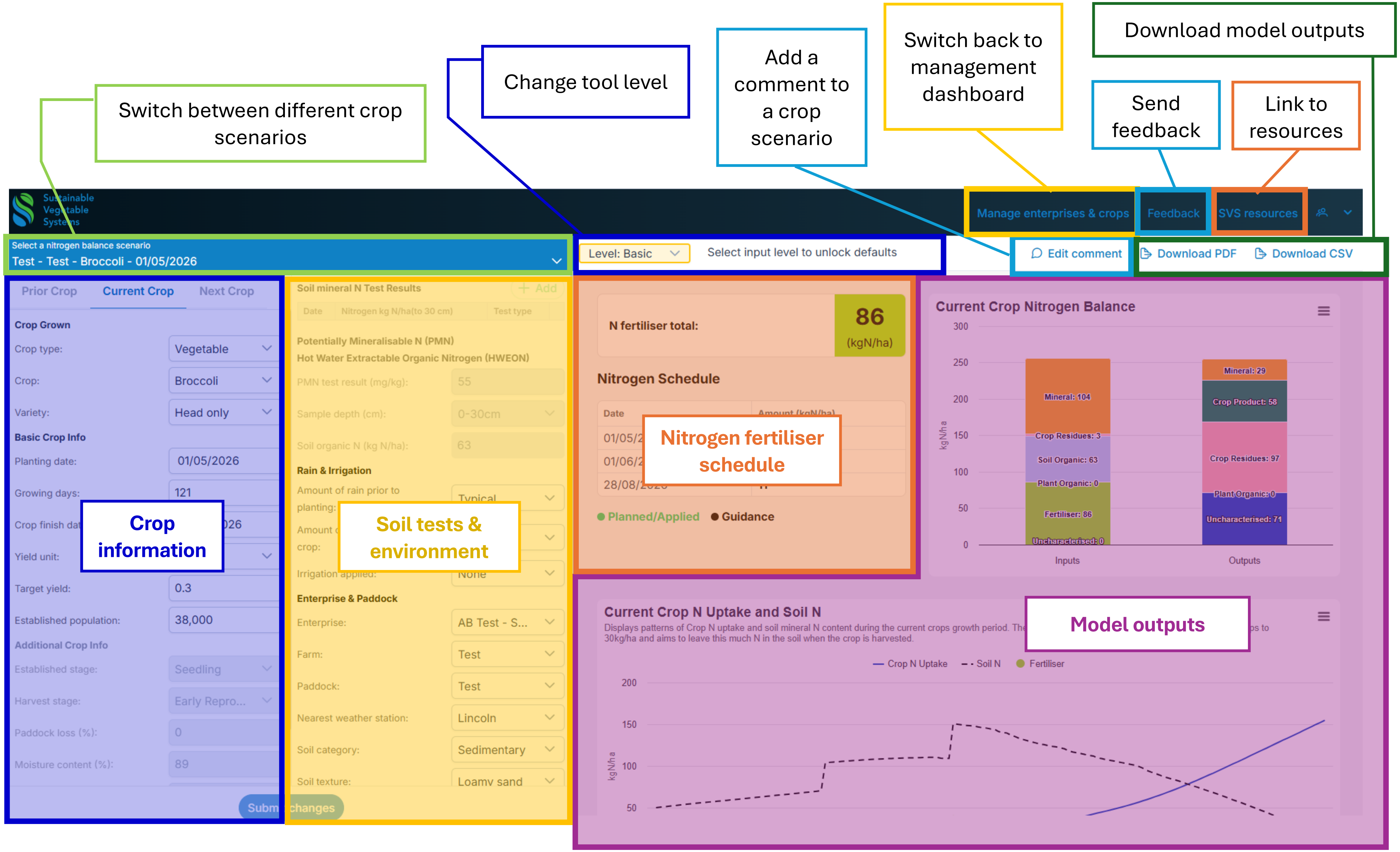



**Figure 2**. Layout of the SVS Tool dashboard with labels.

## 2.3 Tool structure and levels

The SVS Tool is structured using three input levels: Basic, Soil N Tests, and Crop Rotation. Each level, from Basic to Crop Rotation, unlocks different model inputs. This means the tool gives you the ability to model crop rotations that are more suited to your system, instead of producing outputs that are based on default values.

Figure 3 describes what inputs are available at each tool level. The different colours for **Basic**, **Soil N Tests**, and **Crop Rotation** illustrate what model inputs are unlocked at each tool level.

Once you become comfortable using the tool, switching the tool to the Crop Rotation level is recommended to give you the ability to enter your own values for all inputs.

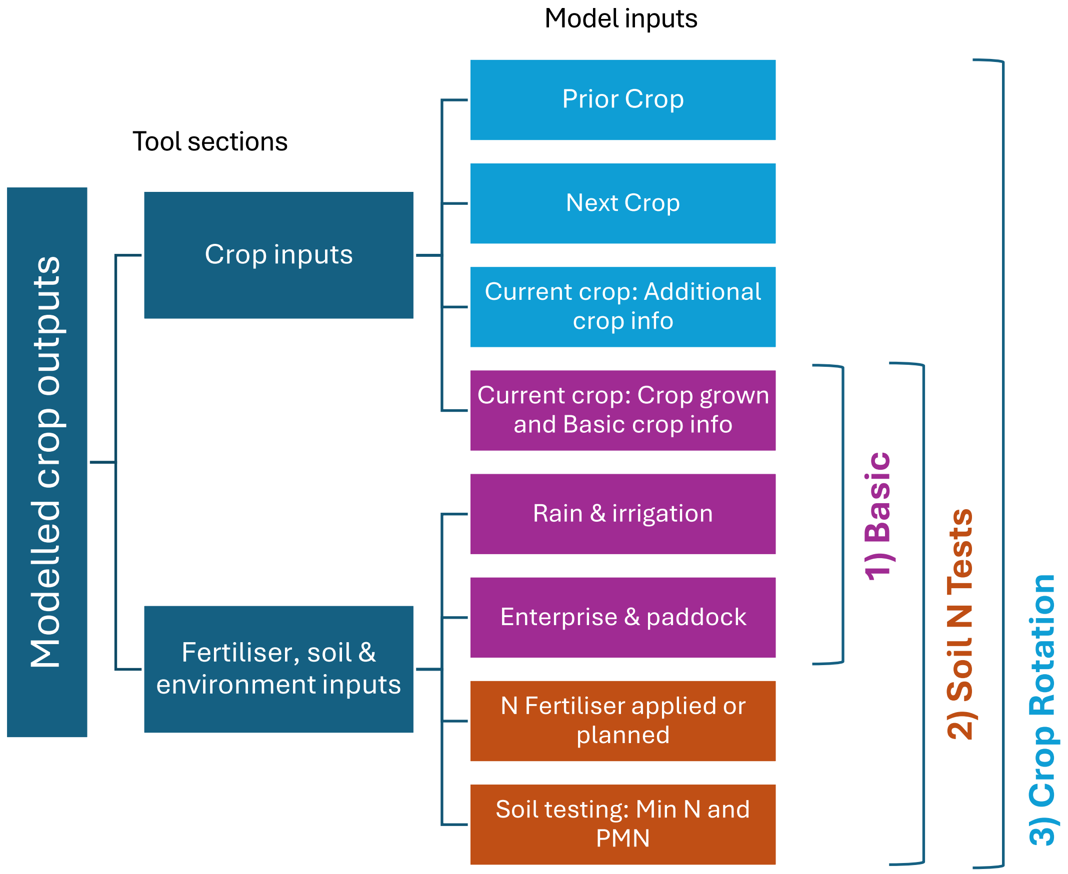



**Figure 3.** Structure of the SVS Tool, its different levels (**Basic**, **Soil N Tests**, and **Crop Rotation**), and the inputs available at each level.

## 2.4 Manage enterprise & crops dashboard

### Overview

The Manage enterprise & crops dashboard (Figure 4) is where you can view and switch between different crop rotations. The dashboard is accessible by selecting **Manage enterprises & crops** in the toolbar.

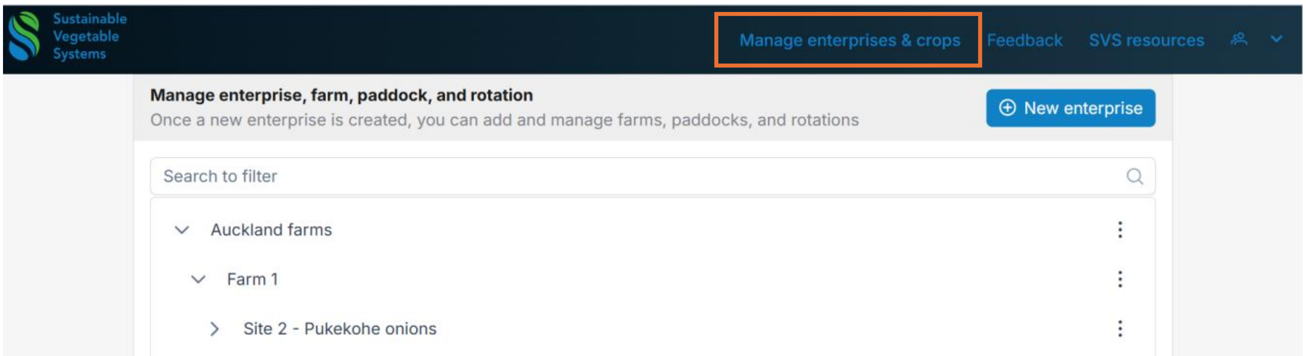


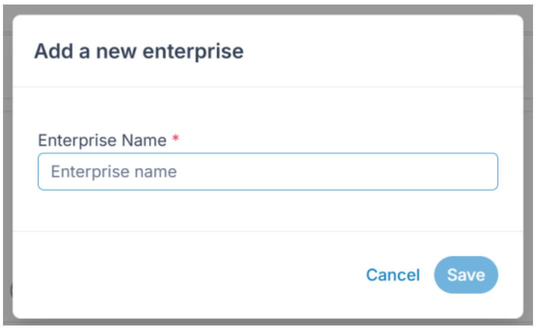

**Figure 4.** The Manage enterprises & crops dashboard of the SVS Tool. This example shows what the dashboard could look like when first setting up the tool.

The dashboard is structured using several levels of information connected to each crop rotation, including *enterprise*, *farm*, *paddock*, and *rotation*.

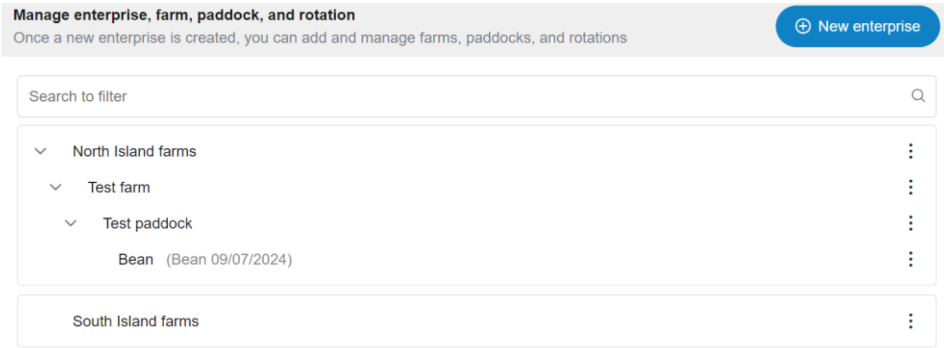
### Adding a new enterprise

1) To add a new enterprise, select the 'New enterprise' button on the top right corner of the dashboard.


2) A pop-up box will open, with a field to enter in a new name. Enter a new name and select **Save**.

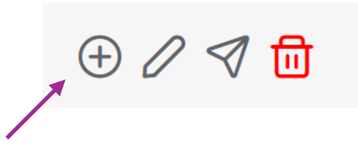



3) The new enterprise will appear underneath the original one set up. In the example below, the new enterprise is called 'South Island farms'.

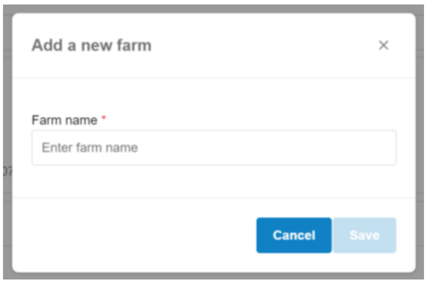



## Adding a new farm, paddock, or rotation

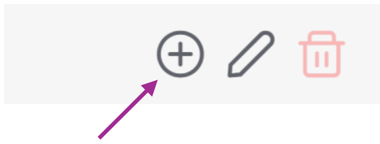
1) To add a **new farm**, hover over enterprise and select the ⊕ symbol on the right side of the screen.



2) A pop-up box will open, with a field to enter in a new farm name. Enter a new name and select **Save**.

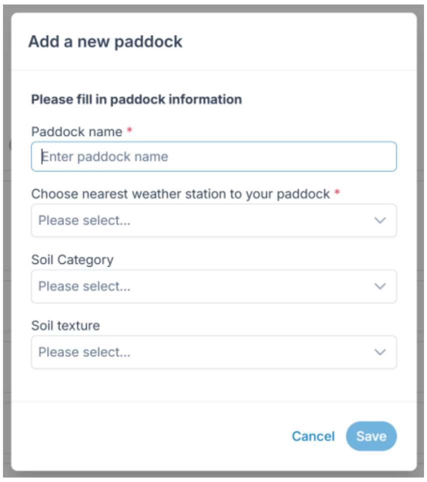



3) To add a **new paddock**, hover over a farm and do the same – select the ⊕ symbol on the right side of the screen.

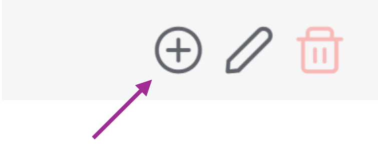


4) A pop-up box will open, with several fields to set up a new paddock. Data available to enter includes:
   - Paddock name
   - Nearest weather station
   - Soil category: *Volcanic* or *sedimentary*
   - Soil texture

   Select **Save** to complete paddock setup.



5) To add a **new crop rotation**, hover over a paddock and select the ⊕ symbol on the right side of the screen.



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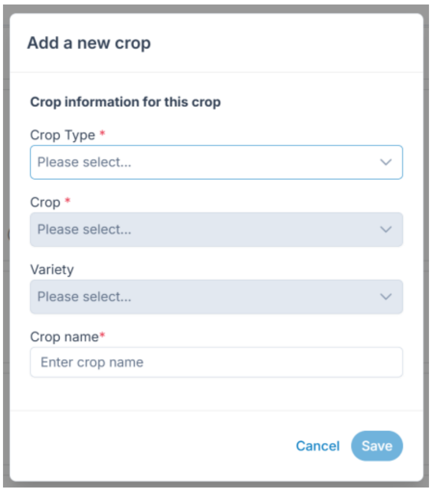
6) A pop-up box will open, with with several fields to set up a new rotation. Data available to enter includes:
   - Crop type
   - Crop
   - Variety
   - Rotation name: An alias for your crop rotation e.g., Broccoli trial variety 1.

   Select **Save** to complete the rotation setup.

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7) The new crop rotation will appear under the paddock with your crop rotation name in black. The name in grey (e.g. Brocc 09/07/2026) shows the crop and planting date, which will initially show up as today's date i.e. the date you add the rotation. This will change once you go into the tool and edit the planting date details.

   When using the tool in the Crop Rotation level, the prior and next crops will show up on either side of the current crop (e.g. Oat-Bean-Kale 09/07/2026).

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## Additional functionality

The Manage enterprises & crops dashboard has quite a bit of additional functionality to make using the tool easier:

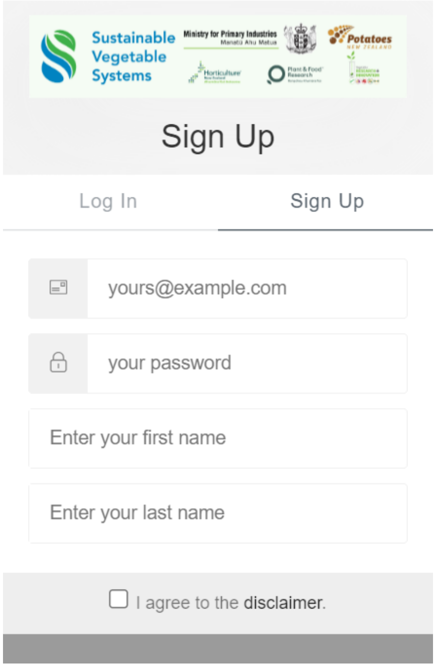
- Each level of information can be expanded or collapsed using the V symbol for easier display, especially if many rotations have been set up in the tool.
- The search bar 🔍 allows you to filter for specific farms, paddocks, or rotations.
- Hover over and click on a rotation to navigate directly to the tool dashboard.
- Move rotations between paddocks by clicking, dragging and dropping the rotation you want to move onto a new paddock.

The dashboard also has a number of buttons that appear when you hover over each information level. The functionality of each button is described below:

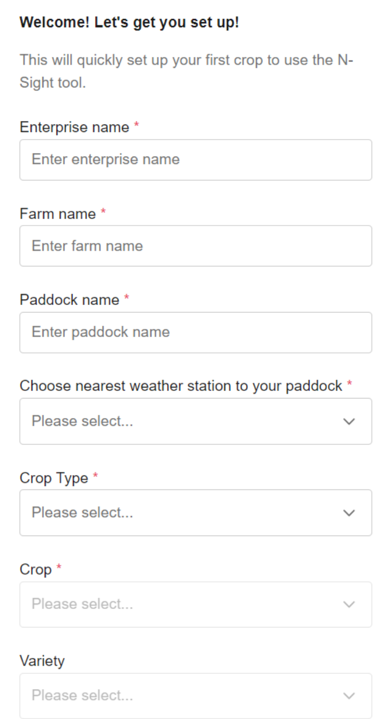
| | |
|---|---|
|  | Edit the name or details of an enterprise, farm, or paddock. Selecting the blue pencil next to a crop rotation allows you to edit the rotation's alias name. |
|  | Use this to delete information from your structure. You will need to delete from the bottom up i.e. clear out all associated rotations before deleting a paddock, then a farm etc. |
|  | This button will advance the rotation from your current crop to your next crop, creating a new rotation. It will label this new rotation as (name)-ADVANCE ROTATION, with your previous current crop becoming the prior crop. Oats are set as the default prior and next crops when no crop rotation data is present. |
|  | Use this to copy an existing rotation. The tool will duplicate the selected rotation and label it as (name)-COPY. |
|  | This button allows you to Share your enterprise and associated farms, paddocks, and rotations, with someone else registered on the SVS Tool.<br><br>When you select the Share icon, a pop-up will prompt you to enter in an email address. After doing this, the whole enterprise you selected to share will appear in the other user's enterprises dashboard (see screenshot below).<br><br>Once the enterprise appears on your dashboard, any edits you make will only be made within your account and will not affect the original user's enterprise on their account, and vice versa.<br><br> |

# 3 Getting started with the tool

## 3.1 Setting up an account




1) The SVS Tool is available at [www.svstool.co.nz](http://www.svstool.co.nz). It will open onto the **Log In** page. If this is your first time using the tool, you will need to select **Sign up**. Enter your email address, a secure password, and your name. You will also need to accept the disclaimer (see disclaimer on page 2). Once you have completed this, you will receive an email to verify your account.




2) After you create your account, the next screen will ask you to set up your first paddock and crop. It may be useful to pick a location, crop, and paddock representative of your operation. However, any details will be fine – you can change all of these once in the tool.

3) Once you enter the details of your first crop, click **Continue**. The tool will then open up to the main SVS Tool dashboard.

## 3.2 Navigating the SVS Tool dashboard

The tool will open up in the **Basic** level for new users. This simply means the tool is helping you out by using default values in the background.


The dashboard consists of four main sections: crop information, soil tests & environment, nitrogen fertiliser schedule, and model outputs. Information entered into the first three sections will be reflected in the model outputs.

Figure 5 shows these four key sections of the tool. Have a look around the dashboard to become familiar with the layout.

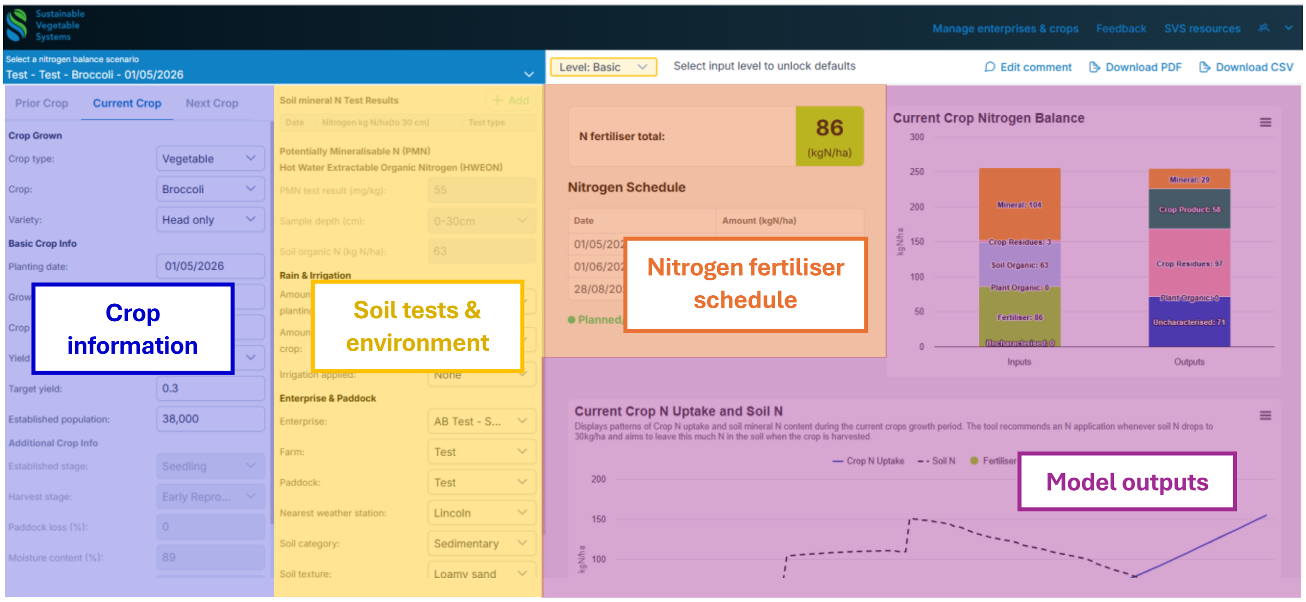



**Figure 5.** Layout of SVS Tool dashboard sections.

## Crop information

This is where you can enter current crop information that forms the basis of your first crop scenario. The section is split into Crop Grown, Basic Crop Info, and Additional Crop Info. Additional Crop Info is locked in Basic level, as are the Prior Crop and Next Crop sections (located on either side of Current Crop).

## Soil tests & environment

This is where soil test and environmental information is entered. In Basic level, soil test results are locked, but you can enter information under Rain & Irrigation and Enterprise & Paddock. The information entered in this section helps to more accurately model the nitrogen (N) dynamics for your specific location.

## Nitrogen fertiliser schedule

This is where guidance on nitrogen fertiliser inputs is provided. In Basic level, the schedule is locked, with a total fertiliser figure and application schedule. In the other levels, the nitrogen schedule, including dates and application rate, can be edited to change the model outputs.

## Model outputs

This is the largest part of the dashboard and displays the model outputs for your crop's N balance. The model takes the information entered into the crop, soil & environment, and nitrogen fertiliser sections to model an N balance scenario and track soil and plant N through the season. The outputs window includes a crop N balance graph, crop N uptake and soil N graph, soil water status and crop cover graph, and a following crop N balance graph.

## 3.3 Creating a nitrogen balance scenario

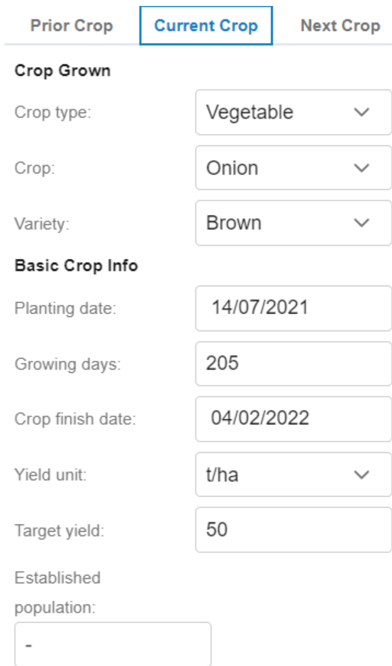
To create an N balance scenario for your operation, you will first need to enter some details into the crop information and soil & environment sections. Some information will be automatically entered into these sections, as you entered these when you set up your account.

**PLEASE NOTE:**
The tool will use your values (plus default values where necessary) to create an N balance scenario and N guidance for your modelled crop. Therefore, the better quality the information you enter, the more useful your outputs will be. On the flip side, unrealistic inputs will generate unrealistic outputs, as the model does not limit results outside of what is expected.

### Entering crop information

1) Go to the left side of the dashboard to look at the crop information menus. The menus include:
    - crop type
    - crop
    - variety
    - planting date
    - growing days
    - crop finish date
    - yield unit
    - target yield
    - established population

Please refer to Table 1 in Appendix 1 if you would like to see all the crops available to use in the tool.

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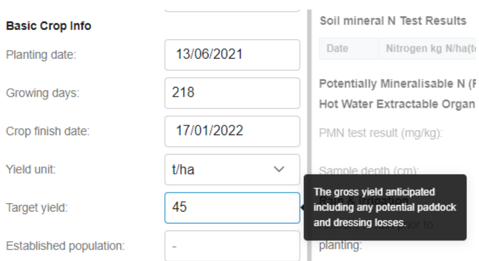
2) Enter in information you would like to use to set up your scenario.

    As there can be some ambiguity when entering crop information (e.g. field yield vs. saleable yield), guidance is provided for planting date, growing days, crop finish date, target yield, and established population. Simply hover your cursor over the input box to read the information pop-up box.

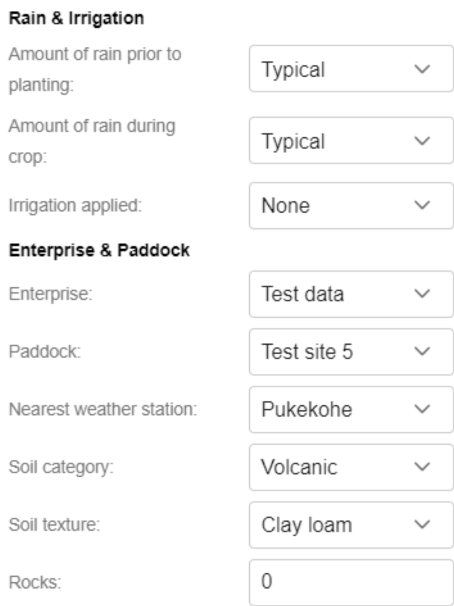


The tool will also automatically populate values for yield unit, target yield, and growing days, once crop and planting information is entered. You can change these values to better reflect your own crop.

3) After adjusting any details, click Submit changes button to save your progress.


## Entering environment information

1) Go to the fertiliser, soil & environment section to look at the information available to enter. You will need to scroll down as the soil and fertiliser sections are locked.

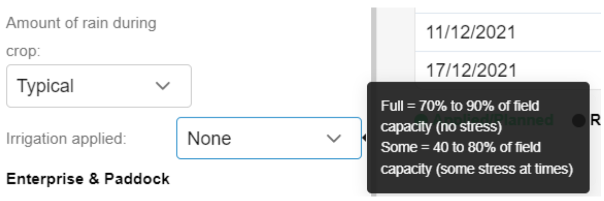



Information available to enter includes:

- rain prior to planting
- rain during crop season
- irrigation applied
- enterprise
- paddock
- nearest weather station
- soil category
- soil texture
- rock percentage

2) Enter your Rain & Irrigation information.

The tool gives you five options to enter the amount of rain your crop received prior to planting and during the crop: *very wet*, *wet*, *typical*, *dry*, and *very dry*.




Guidance is provided on what each of these rainfall categories mean in reality – simply hover your cursor over the dropdown menu to see the information pop-up box. The default setting is *typical*.

Irrigation can be added using three options: *none*, *some*, or *full*. Once again, guidance is provided by hovering over the dropdown menu. The default setting is *none*.

3) Enter your Enterprise & paddock information.

   Specific information about your crop's growing environment, including soil and location, can be entered here. Further information about managing enterprises can be found here.

   Other information in this section includes paddock (you will only have one to begin with), nearest weather station, soil category (*volcanic* or *sedimentary*), soil texture, and rock percentage. Feel free to adjust these to reflect the conditions of the paddock your crop is growing in. If you don't know your paddock's soil information, this information can be found on https://smap.landcareresearch.co.nz/ or https://lris.scinfo.org.nz/.

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4) After adjusting any details, click the Submit changes button to save and update your output screen.

   Submit changes

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## Adding a comment

Edit comment

If you would like to add a comment about the crop scenario you are modelling, please use the **Edit comment** button, located in the top toolbar above the Model Outputs. A pop-up box will open, allowing you to write a few notes if required.

Please ensure you **Save** your changes.

You have now entered all the information needed to generate a model output for your crop N balance scenario. The next section of this user guide will go into detail about how to interpret each piece of information and graph in the Model Outputs section.

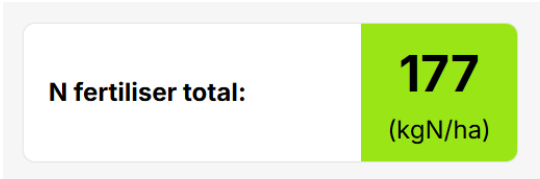
As it will cover a lot of content about N cycles, please refer to the introductory notes if you require more background information on this subject.

# 4 Understanding the model outputs

The model outputs section of the SVS Tool will provide you with the tool's predictions of nitrogen (N) flows within your modelled crop, including guidance on N fertiliser rates to apply, supporting your decision making throughout the season.

This section will cover the outputs under the **Basic** level of the tool, including N fertiliser guidance, following on from 3 Getting started with the tool. This will include key information you need to know to interpret the model outputs. Please see sections 5 Level: Soil N tests and 6: Level: Crop rotation for more information on what to expect when using the tool in the more advanced levels.

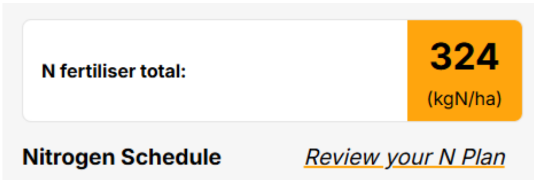
## 4.1 Nitrogen fertiliser total




Under the Basic level, you are provided with an **N fertiliser total** figure in kg N/ha.

This number is a guide for how much N to apply to your modelled crop in order to achieve the target yield. The model takes all of the inputs from the crop information and fertiliser, soil & environment sections and predicts how the levels of N will change over the growing season. If there is insufficient N available for the crop to reach the Target yield, it will display the amount of N fertiliser required to achieve this. To note, the N guidance does not account for legume N fixation in modelled legume crops – the guidance figure will display N inputs needed for the crop, assuming fertiliser will make up the difference. This is an area of future work.

### Review your N Plan pop-up




If the model calculates the crop will finish with greater than 75 kg N/ha of soil mineral N, the nitrogen guidance will change colour to orange, and pop-up with a notice to *Review your N plan*.

Under Basic level, the nitrogen fertiliser schedule (next section) cannot be edited. However, when using the tool in the Soil N test or Crop Rotation levels, this fertiliser schedule can be edited to adjust the inputs and reduce soil mineral N at harvest.

**PLEASE NOTE:**
This N fertiliser figure is modelled guidance, based on both the information you entered, as well as many default values in the background of Basic level. Do not be alarmed or think the tool doesn't work if this figure looks unrealistic! The more information you enter into the tool in the advanced levels, the more accurate the output will be.

## 4.2 Nitrogen fertiliser schedule

**Nitrogen Schedule**

| Date | Amount (kgN/ha) |
|---|---|
| 25/08/2026 | **77** |
| 25/09/2026 | **84** |
| 12/10/2026 | **91** |

● Planned/Applied ● **Guidance**

By default, the tool splits the N schedule into 3 applications, if N is required for the crop. In Basic level, the N schedule only includes the tool's ● **Guidance** applications (coloured black). You can enter your own N applications when using the Soil N tests and Crop Rotation tool levels.

The model that sits behind the tool schedules fertiliser applications using several rules. These rules include:

- Fertiliser is scheduled on the planting date to ensure the crop has 33% of its requirements in the soil, at planting. This application can be adjusted if using the crop in the next level (Soil N tests or Crop rotation). If sufficient soil mineral N is present at planting, fertiliser will be scheduled when next required by the crop.
- Fertiliser becomes fully available 10 days post application. The model output graphs demonstrate this lag in availability. Future model improvements may allow the selection of different fertiliser types (e.g. slow vs. fast release N).
- All fertiliser is scheduled before the crop has achieved 75% of its N uptake.

## 4.3 Current crop nitrogen balance

The first graph, to the right of the N schedule, shows the **N inputs** and **outputs** (in kg N/ha) for the crop you have modelled. The purpose of this graph is to aid understanding of where N has come from, and where it might go.

In the tool, hovering your mouse over each bar in the graph (Figure 6) will pop up an explanation of what the different categories mean. The explanations have also been provided below for your reference. The hamburger icon (☰) in the top right corner of the graph allows you to save/download your graph.


**Figure 6.** Model outputs: Current crop nitrogen balance example scenario.

| Inputs | Outputs |
|---|---|
| **Mineral:** Mineral N in the top 30 cm of soil at harvest of the prior crop. | **Mineral:** Mineral N in the top 30 cm of soil at crop finish date. |
| **Crop residues:** Nitrogen in non-product parts (in seed or transplants). | **Crop residues:** Nitrogen in non-product crop parts such as roots, leaves and stems. |
| **Plant organic:** Nitrogen released by decomposition of the previous crop's organic matter (typically referred to as mineralisation of crop residues). | **Plant organic:** Nitrogen absorbed (immobilised) by decomposition of the previous crop's organic matter (typically referred to as immobilisation of crop residues). |
| **Fertiliser:** Nitrogen fertiliser. | **Crop product:** Nitrogen in crop product (including any potential paddock losses). |
| **Uncharacterised:** Adjustment for uncharacterised under prediction in initial mineral or organic residue inputs that would be needed to achieve the soil test value specified. | **Uncharacterised:** Adjustment for uncharacterised losses including percolation below 30 cm (which may still be available), gaseous emissions and over predictions in initial mineral, soil organic, or residue inputs that would be needed to achieve the soil test value specified. |
| **Soil organic:** Mineralised N released from total soil nitrogen pool during crop growth. | |

## 4.4 Current crop N uptake and soil N

Figure 7 shows how the tool generates its N fertiliser guidance for your crop N balance scenario. The key components of this graph are the **Crop N** uptake curve (—) and **Soil N** curve (---). **Fertiliser** ( ) and **Measured Soil N** (●) may also appear, but in Basic level, measured soil N is unavailable. Hovering your mouse over the graphed lines will populate the modelled values for each component.

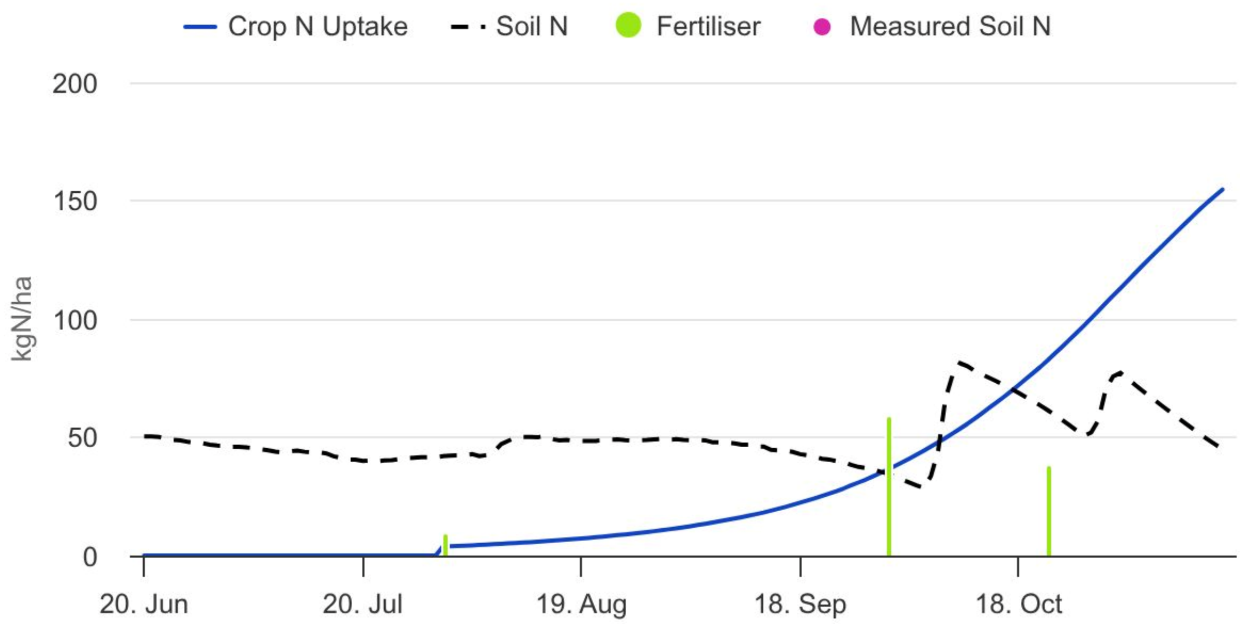



**Figure 7.** Model outputs: Current Crop N Uptake and soil N for a modelled winter broccoli crop in Matamata with 'typical' rainfall.

## Crop N uptake

The crop N uptake curve shows the cumulative crop N uptake over the current crop growing period. In Figure 7 (a Matamata winter broccoli crop), initial crop N uptake is low as the crop establishes. From September onwards, N uptake slowly increases, finishing up in November (estimated harvest) at a total N uptake of ~ 150 kg N/ha.

## Soil N

The soil N curve represents the amount of mineral N in the soil from the harvest of the previous crop through to harvest of the current crop. Mineral N refers to plant available N for crop uptake and consists of nitrate and ammonium. Soil mineral N content is determined by many factors, including soil type, environmental conditions, current crop type, prior crop residue, and soil microbial activity. The model triggers a fertiliser application when soil mineral N is too low to match crop N demand over the next 14 days. This is illustrated in Figure 7, where soil mineral N is not high enough coming into spring to sustain the broccoli crop's N requirements.

## Fertiliser

If the tool recommends N fertiliser to support crop N uptake levels, suggested applications will appear on the graph as green bars ( ). These will also appear in the **Nitrogen Schedule** table. In Figure 7, you can see 3 fertiliser applications have been triggered, lifting soil N to sustain crop demand, including one small application at planting, to ensure the crop has enough mineral N beside the small developing roots Soil mineral N responds over a 10-day period post fertiliser application, because the model assumes fertiliser is not immediately available to the plant.

Using the tool in Soil N test or Crop rotation levels allows editing of the fertiliser applications.

**PLEASE NOTE:**
The tool uses generic rules to guide fertiliser application timing and quantities. This tool should be used to help support the decision-making process. Use this as the starting point for setting up your nitrogen fertiliser plan. You need to be in the Soil N Tests level and above to change the fertiliser plan. Then track performance through the season with soil tests.

## 4.5 Soil water status and crop cover

The second graph in the model outputs section, 'Soil water status and crop cover', shows the soil water dynamics of your modelled crop's N balance scenario. There are four components to this graph: **SWC** (soil water content, ---), **green cover %** (—)**, drainage** (---), and **irrigation** (if selected, ). Figure 8 shows an example of this graph that is modelling a summer pea crop in Ashburton with 'typical' rainfall and 'full' irrigation.

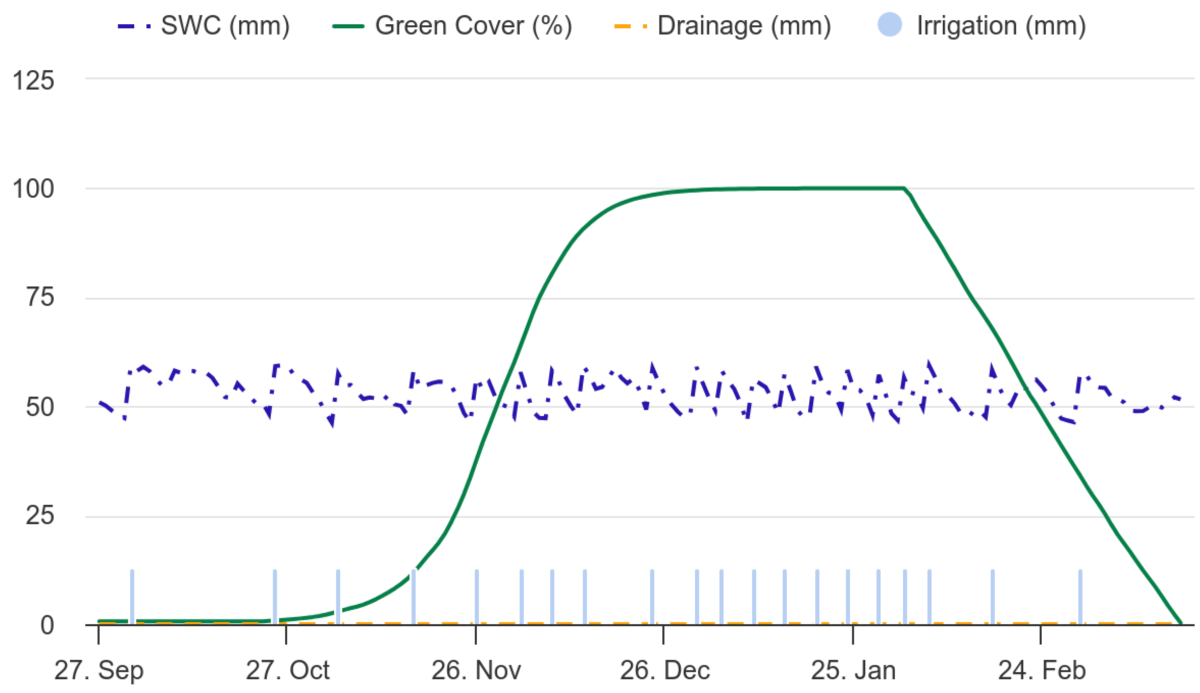



**Figure 8**. Model outputs: Soil water status and crop cover of a summer pea crop in Ashburton with 'typical' rainfall and 'full' irrigation.

## SWC (mm)

Soil water content (mm) is modelled from rainfall, irrigation, and potential evapotranspiration. In Figure 8, SWC fluctuates throughout the crop's growing season, the fluctuations generally aligned with irrigation applications (set to full irrigation).

## Green cover (%)

Green cover % illustrates the amount of canopy cover produced by the modelled crop and indicates the crop's maturity over the crop cycle. This will influence the model outputs for SWC, drainage, and irrigation, as the crop's water requirements change with crop stage. For example, Figure 8 shows how less irrigation is scheduled later in the season, as the pea crop begins to senesce.

## Drainage (mm)

The orange dotted line represents modelled drainage – that is, the amount of water that is lost from the soil profile when field capacity is reached (maximum amount of water the soil can physically retain after excess water has drained). In Figure 8, there is limited, if any drainage, as the spring/summer climate in Ashburton is typically drier. The drainage model helps to show when N could potentially be leached from the soil profile, especially if large applications are applied during times of high drainage potential.

## Irrigation (mm)

If either 'some' or 'full' irrigation is selected in the tool, irrigation (mm) will show up on this graph as light blue bars. Figure 9 shows what might appear on the graph under each irrigation setting, given the crop is grown during a season where moisture stress is likely to occur i.e. summer.

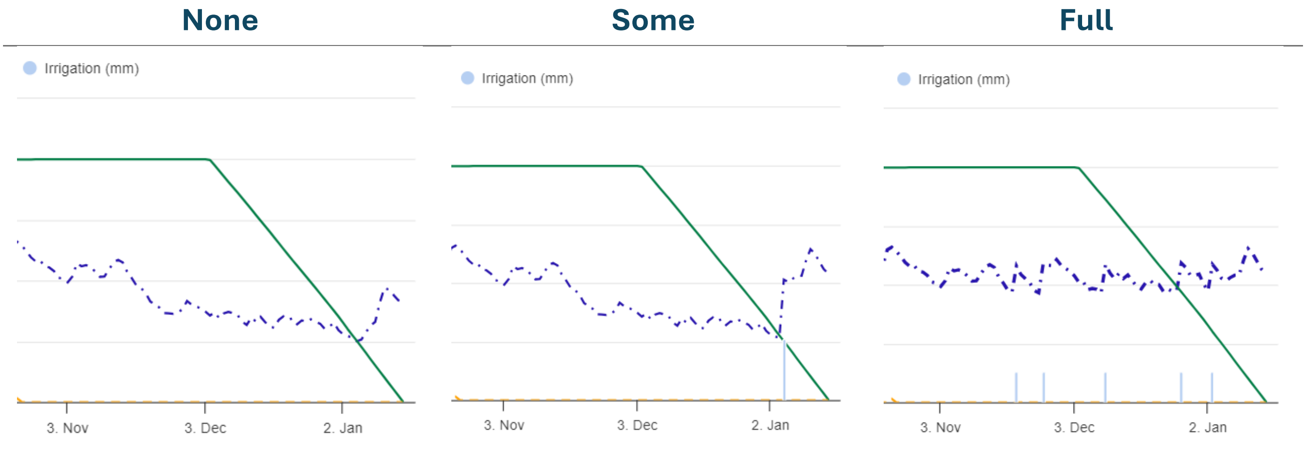



**Figure 9**. Model outputs comparing different irrigation settings ('none', 'some', 'full') within the SVS Tool.

## 4.6 Following crop nitrogen balance

The final graph in the Model Outputs section of the tool is the Following Crop Nitrogen Balance graph. This graph (Figure 10) shows **crop N uptake** (—), **mineral N** content (---), and potential **fertiliser** ( ) for the crop following the current crop. The purpose of this graph is to illustrate soil N levels following the harvest of your current crop. This can guide decision-making for post crop paddock management.

For example, Figure 10 models soil mineral N content after the harvest of a winter broccoli crop. As broccoli crops produce a lot of in-field residue, this can lead to high soil mineral N after a crop is harvested as residue is subsequently broken down and mineralised. This could trigger a decision to plant a short rotation 'catch' crop, or shift any plantings planned for spring a month earlier, to make use of the available N in the soil. In the Crop Rotation tool level (find more information here), you can model different following crops to learn about the impact on soil N.

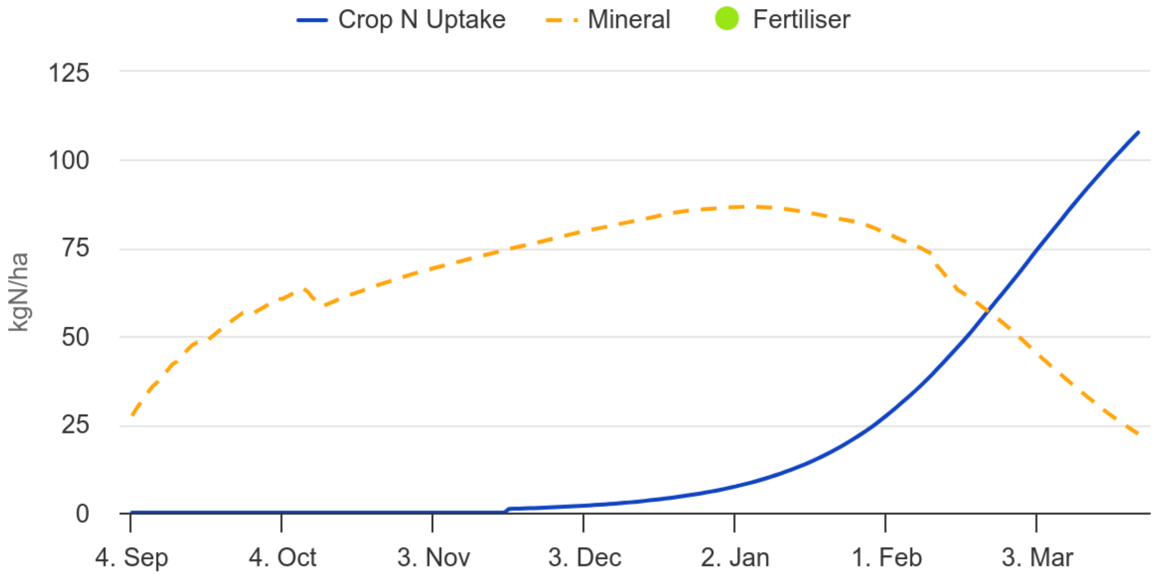


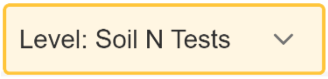

**Figure 10.** Model outputs: Following crop nitrogen balance after a winter broccoli crop.

## 4.7 Downloading model outputs


If you would like to download the model outputs for your N balance scenario, please select the **Download PDF** button just above the Current Crop Nitrogen Balance graph. As mentioned earlier, graphs can be downloaded individually using the hamburger icon (☰) in the top right corner of each graph.

**Download CSV** will download all the data inputs and outputs into a .csv file.

# 5 Level: Soil N Tests




## 5.1 Overview

Now that you are comfortable with the tool functionality in the **Basic** level, it is time to familiarise yourself with the **Soil N Tests** level. This level allows you to input more information into the soil & environment, and nitrogen fertiliser schedule sections.

Adding your own fertiliser and soil data means the tool can output guidance based on actual values you have measured, instead of relying on default values. This improves the accuracy of the tool and the guidance it provides.

Using the SVS Tool at the **Soil N tests** level allows you to input your own values for:

- Actual/planned fertiliser application quantities (kg N/ha)
- Number and timing of fertiliser applications
- Soil mineral N test results: Nitrate Quick Test and laboratory results (mg/kg)
- Potentially mineralisable N (PMN) test results (mg/kg)

Figure 11 shows the location on the tool dashboard where these values can be entered.

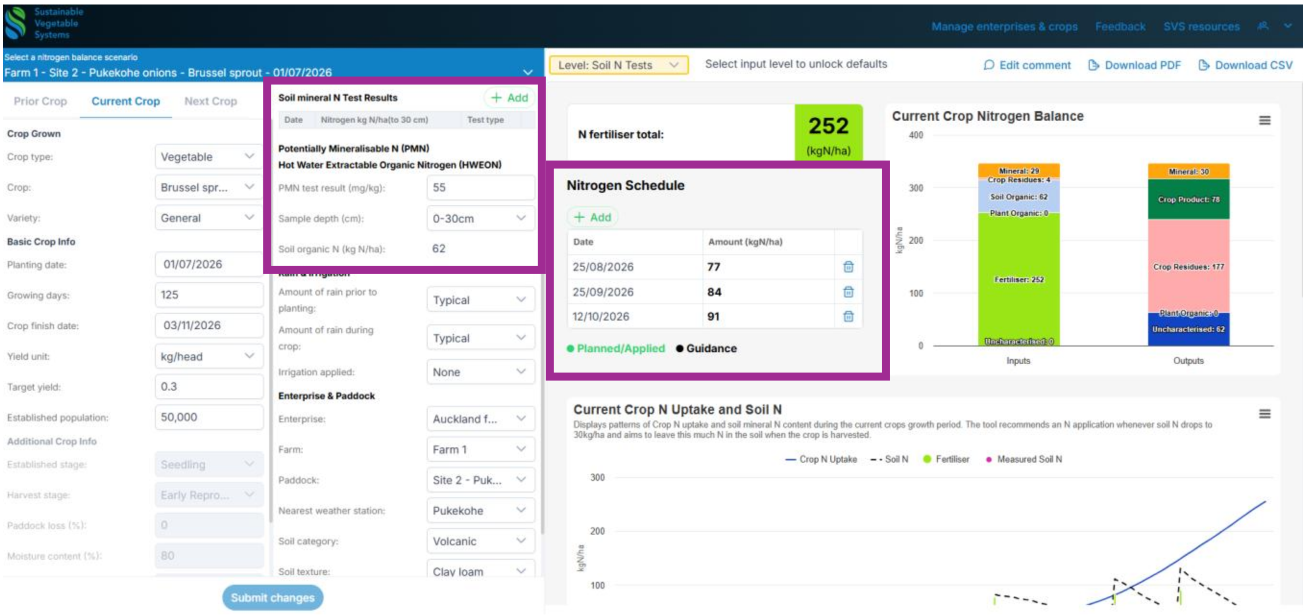



**Figure 11.** SVS Tool dashboard in Soil N test level. Purple boxes indicate the new tool inputs available.

## 5.2 A note on soil N testing

With a wide range of tests available, knowing what N test to order, to get the information you need, can be complex. An understanding of soil N and its different forms is useful information to have when soil testing – jump to 1.4 Nitrogen overview for a refresher.

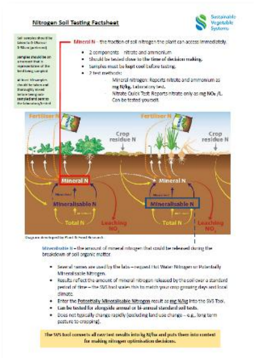
The SVS Tool uses data from three soil N tests: the Nitrate Quick Test, a laboratory Mineral N test, and the Hot Water Extractable Organic Nitrogen (HWEON) test. These tests are summarised below.

## Nitrate Quick Test


The Nitrate Quick Test is fast and relatively cheap tool for growers who wish to understand the level of plant available nitrate in the soil. The Nitrate Quick Test only measures the nitrate component (ammonium being the other) of plant available mineral N, but typically in most cultivated/well aerated soils, this is the dominant form. It is a 'quick test', so you can test and get the result the same day.


A video explaining how to carry out the Nitrate Quick test can be viewed here, or by clicking on the screen image. Alternatively, Foundation for Arable Research produced an in-depth guide about the tool, The Nitrate Quick Test Mass Balance Tool, also linked in the Resources section at the end of this guide.

## Laboratory Mineral N testing




Soil testing labs offer a Mineral N test, measuring the fraction of soil N plants can access immediately. Lab Mineral N tests measure both nitrate and ammonium (unlike the Nitrate Quick Test).

A guide on how to order Mineral N tests from different soil labs was created for the SVS project, to help demystify this process! Please access the guide here or find it in the Resources section.

## Hot Water Extractable Organic Nitrogen (HWEON) test

This test, also known as the 'Hot Water N' test, can be used to estimate the portion of organic nitrogen that will mineralise in the soil under ideal conditions (soil temperature 25°C and moisture 90% of field capacity) and become crop available. This portion of soil N is known as potentially mineralisable nitrogen (PMN).

Soil temperature and water content are the biggest variables that affects how much of the PMN is actually released (mineralised) under field conditions. The SVS Tool uses your entered PMN value (mg/kg) along with your own local climatic conditions (based on your selected location) to estimate how much mineral will be released (via mineralisation) to your crop over its growing period.

More information on PMN testing can be found in the same soil nitrogen testing factsheet linked above in Laboratory Mineral N testing.

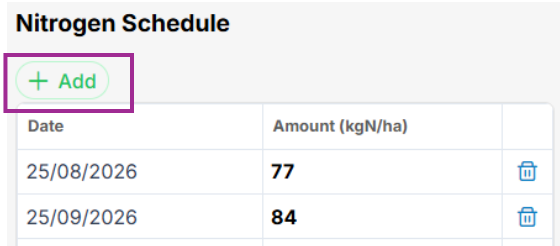
## 5.3 Nitrogen schedule: Planned/Applied

As the SVS Tool is a decision support tool, the nitrogen fertiliser input section allows you to use the tool to plan N fertiliser applications from the beginning of the crop, add all of your own planned (or applied) fertiliser applications, or use a combination of your own applications alongside tool guidance throughout the growing season.

### Adding or editing fertiliser applications

1) To add fertiliser applications to your modelled crop (either planned or applied), click on the **+ Add** button. The tool will add another line to the nitrogen schedule with Date, Amount (kg N/ha), and a delete icon.

   Clicking **+ Add** again will add another row to the table.

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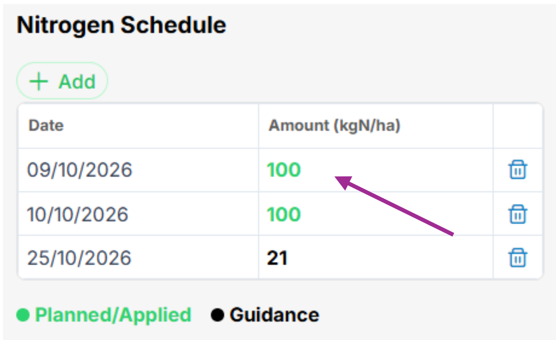
2) Edit the new line added and add the dates for your planned or applied N fertiliser applications and the amount of N contained in each application, in kg N/ha.
   You can also edit the original, guidance fertiliser values, to suit your crop scenario.

---

3) Click **Submit changes** to save this information into the tool.

   The applications you entered will appear in the Nitrogen Schedule table in **green**.
   The tool will automatically adjust any **black guidance** values, if the model indicates more N may be needed to meet the set target yield.

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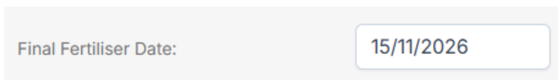
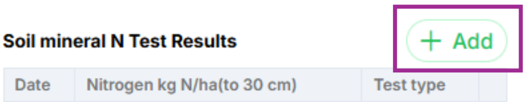
The tool also provides an option to set a **final fertiliser date**. This is to prevent the tool from scheduling applications if a grower would not apply fertiliser after a certain crop stage (i.e., after canopy closure).

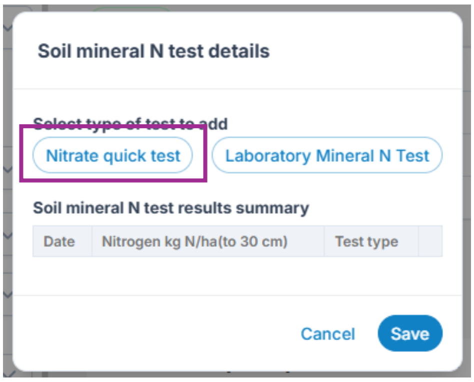


## 5.4 Soil mineral N test results

### Adding Nitrate Quick Test results

1) To add a Nitrate Quick Test result, click the **+ Add** button next to **Soil mineral N test results**. A pop-up box will appear with options to add a Nitrate quick test or a Laboratory Mineral N Test.

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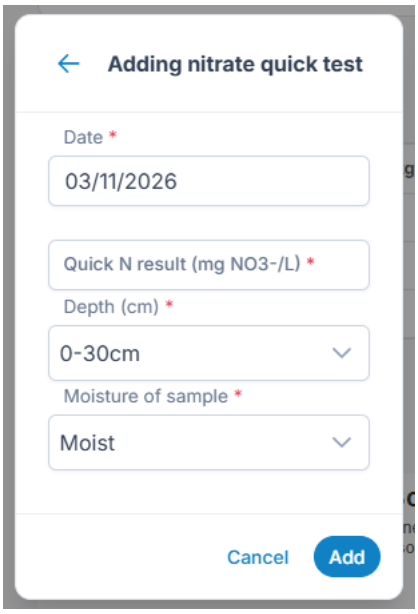
2) Select **Nitrate quick test**. This will open a new pop-up to enter your result.

   Details required include:
   - date (that you took the test)
   - raw Nitrate Quick Test result (mg $NO_3^-$/L)
   - depth (cm) sample taken at
   - moisture of sample (*dry*, *moist*, or *wet*)

   The Nitrate Quick Test result should be the number you read off of the testing colour chart – the tool will convert this result into in kg N/ha using the information you input.

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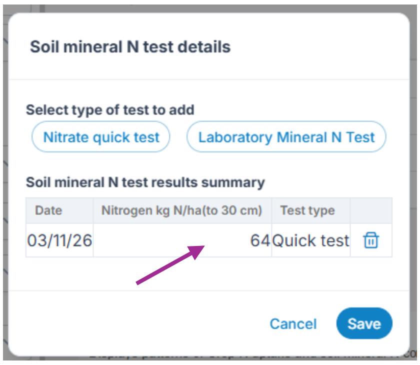
3) After clicking **Add**, the previous pop-up will reappear, with your Nitrate Quick Test result now recorded in kg N/ha.

   The tool converts this to an N content to 30 cm depth.

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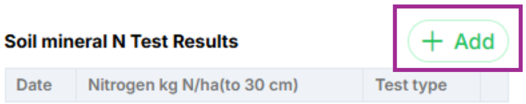
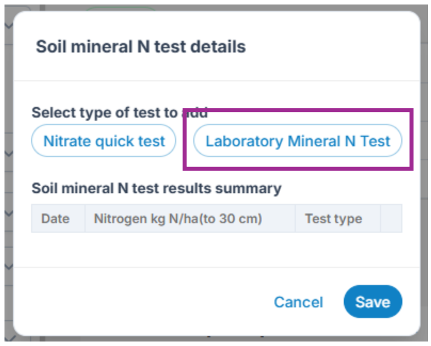
4) Click the **Save** button to save your result. You will now see the test result appear under the **Soil mineral N Test Results** section in a table, like the fertiliser application entries.

## Adding Laboratory Mineral N test results

1) To add a lab mineral N result, click on the **+ Add** button next to **Soil mineral N test results**.
A pop-up box will appear with options to add a Nitrate quick test or a Laboratory Mineral N Test.



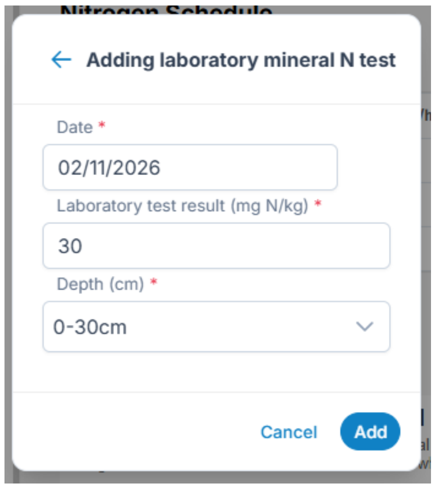




2) Select **Laboratory Mineral N test**. This will open a new pop-up to enter a lab test result.

Details required include:

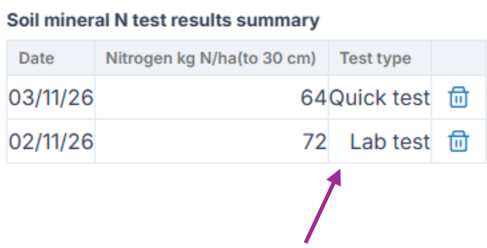
- date (that you took the test)
- lab test result (mg N/kg)
- depth (cm) sample taken at

The lab test result should be the result provided on your soil test results for Mineral N in mg N/kg. The tool will convert this to kg N/ha.



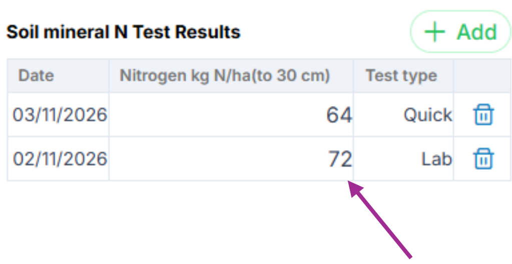

3) After clicking **Add**, the previous pop-up will reappear, with your lab mineral N test result now appearing in kg N/ha, labelled as Lab test.

The tool converts this to an N content to 30 cm depth.


Soil mineral N test results summary

| Date | Nitrogen kg N/ha(to 30 cm) | Test type | |
|---|---|---|---|
| 03/11/26 | 64 | Quick test | |
| 02/11/26 | 72 | Lab test | |

4) Click the **Save** button to save your result. You will now see the test result appear under the **Soil mineral N Test Results** section in a table, like the fertiliser application entries.


Soil mineral N Test Results + Add

| Date | Nitrogen kg N/ha(to 30 cm) | Test type | |
|---|---|---|---|
| 03/11/2026 | 64 | Quick | |
| 02/11/2026 | 72 | Lab | |

## 5.5 Potentially mineralisable nitrogen (PMN)

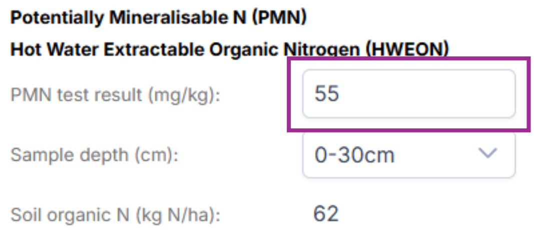
The default PMN value (under **Basic** level) is 55 mg/kg at a sample depth of 0-30 cm. The tool converts PMN to a soil organic N number, which is displayed in the current crop nitrogen balance graph (inputs column) in the model outputs section.

### Adding a PMN result

Find a recent soil test where you tested for PMN. The date of the test does not matter – the tool will adjust the model outputs based on your location and the modelled crop's growing period.

---

1) To add a PMN lab test result, enter the result in the box next to **PMN test result (mg/kg)**, ensuring the lab units are also in mg/kg.

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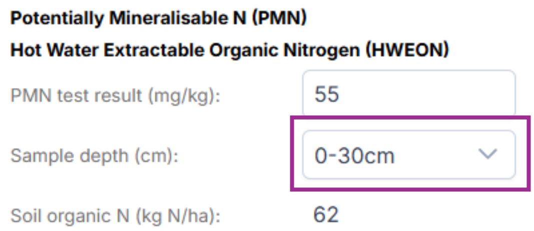
2) Next, add the **sample depth (cm)** you took your sample at. Four depths are available: 15, 30, 60 and 90.

   The tool will convert your values to 0-30 cm.

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3) Click **Submit changes** at the bottom of the page to save your PMN result.

## 5.6 Interpreting the model outputs

The addition of your own fertiliser and soil data in the **Soil N Tests** level will generate different model outputs that more accurately reflect the N dynamics in your modelled crop scenario. **Measured values beat modelled values every time!** The model outputs panel will have the same sections as in the Basic level, but you may notice some differences in the crop N balance, and the Current Crop N Uptake and Soil N graphs. Refer back to 4 Understanding the model outputs if required.

To help illustrate how soil test results affect the model outputs, Figure 12 models two PMN result scenarios – the bar on the left shows crop inputs with a PMN of 70 mg/kg; the bar on the right displays the inputs with a PMN of 50 mg/kg. As you may see, the soil organic fraction has changed. This emphasises the importance of collecting and entering your own data into the model, as the results will change!

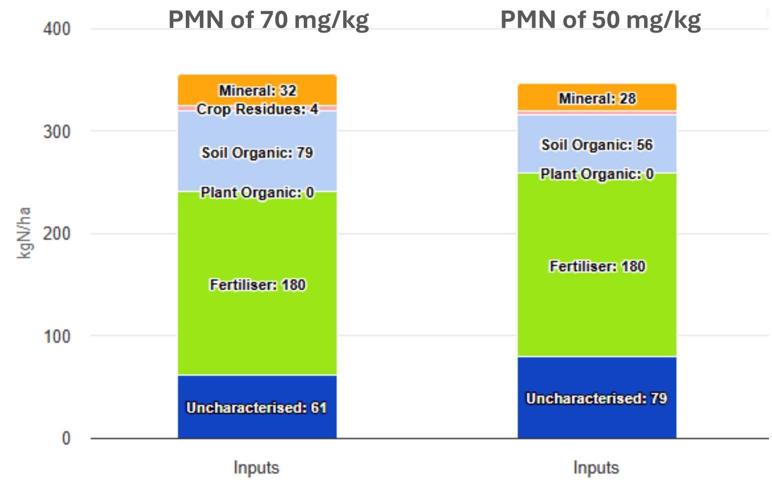



**Figure 12**. The change in crop inputs when potentially mineralisable nitrogen (PMN) changes. The bar on the left models N inputs with a PMN result of 70 mg/kg. The bar on the right models N inputs at a PMN of 50 mg/kg.

If you have entered soil mineral N results, these will appear on the Current Crop N Uptake and Soil N graph as a pink dot (●) – see Figure 13. Soil mineral N is now reset to this measured value. Look at the graph and see how the soil N (**---**) changes with your measured values. It may also influence the timing of recommended fertiliser applications ( ), if you haven't entered any of your own applications.

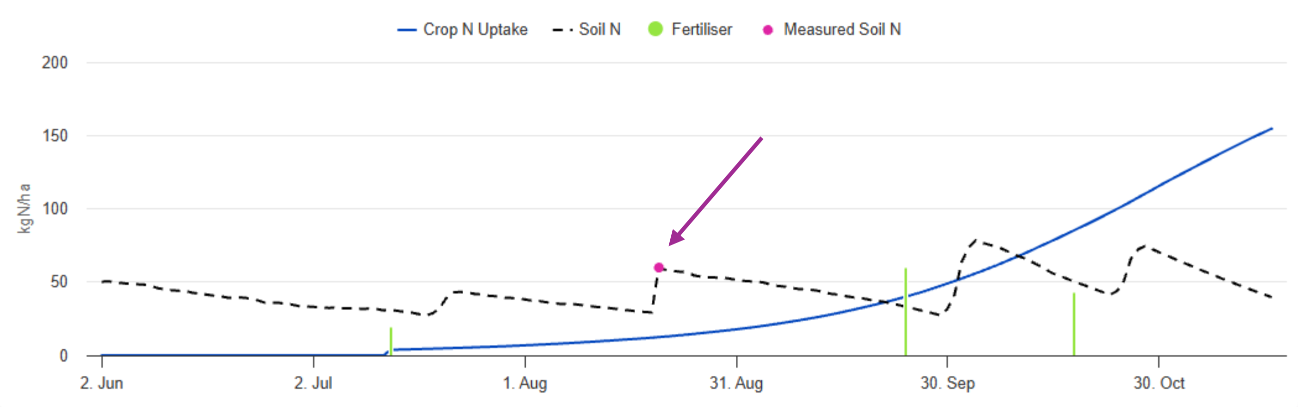
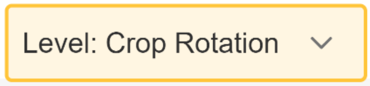


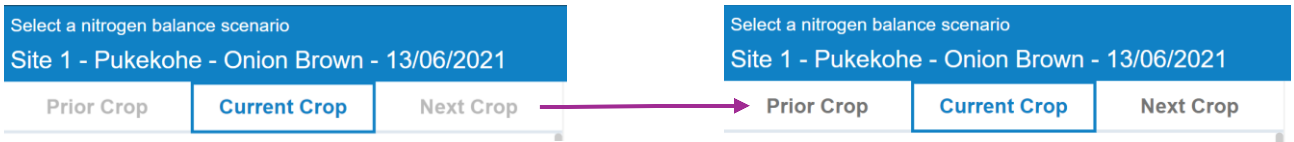

**Figure 13**. Current crop N uptake and soil N with measured soil N test result graphed.

# 6 Level: Crop rotation




## 6.1 Overview

Running the SVS Tool in the **Crop Rotation** level gives you the largest amount of customisation. The Crop Rotation level opens up two additional data input sections under the Crop Information panel: **Prior Crop** and **Next Crop**.




Entering in your Prior Crop data, including details such as residue treatment, allows the tool to more accurately determine the soil nitrogen (N) levels your current crop will have available to it. This will impact the amount of organic and mineral N present in the soil, influencing the N guidance provided.

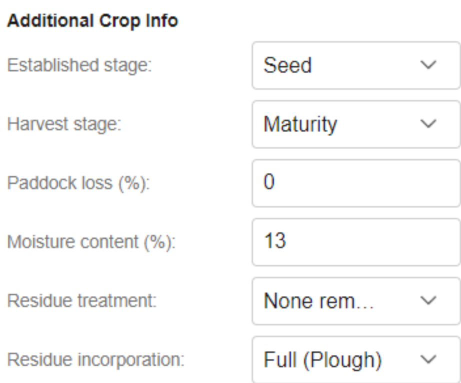
The crop rotation level also opens up Additional Crop Info under Current Crop, as well as the Next Crop section. The purpose of understanding the N dynamics of the following crop is to aid decision making around residue management. For example, if modelled N levels after your current crop are high, you could move forward your next planting or sow a catch crop, to either use the N present, or prevent its potential loss to the environment.

Once comfortable with using the SVS Tool, we recommend users continue to run the tool in the Crop Rotation level. This is because all the information entered into the N balance scenario is your own. This means that the model outputs will be tailored as close as practical to represent the nitrogen dynamics within your system.

## 6.2 Current crop

In addition to Crop Grown and Basic Crop Info, a new section, Additional Crop Info, becomes available under Current Crop.

Have a look at the dropdown menus to see what options are available for each input.



This section allows you to enter the following information:

- Established stage: Planted as a seed or seedling
- Harvest stage: The crop's growth stage when harvested
- Paddock loss (%): The proportion of potential crop left unharvested
- Moisture content (%): Percentage of harvested product that is water
- Residue treatment: Destination of crop residues after harvest
- Residue incorporation: Treatment of crop residues after harvest (model currently assumes all residues are fully incorporated).

Default values are automatically populated for established stage, harvest stage, and moisture content, based on the crop information entered. So, you don't need to worry about calculating the moisture % of your crop.

## 6.3 Prior crop and Next crop

The Prior Crop and Next Crop sections are available by selecting **Prior Crop** or **Next Crop**, adjacent to **Current Crop**, under the blue N balance scenario bar. Both sections have exactly the same headings and options as Current Crop.

Please refer to 3.3 Creating a nitrogen balance scenario for a refresher on entering information into the crop information section. Remember, measured values beat modelled values, so the more information you enter, the more accurate the model outputs will be.

To note, in the Prior Crop the Crop finish date remains static when you change the Planting date or Growing days. Set this first and then adjust either the Planting date or Growing days.

## 6.4 Interpreting the model outputs

The model outputs will change with the addition of Prior and Next crop information. Refer back to 4 Understanding the model outputs if you require more information on the Model Outputs section.

# 7 FAQs and troubleshooting

## 7.1 FAQs

### Where do the default values come from? Is the tool based on real data or just a model?

The model that forms the basis of the SVS Tool has been built on scientific research trials conducted around New Zealand by BSI - Bioeconomy Science Institute (formally Plant and Food Research), as well as research from published literature, including international studies. Grower data, collected from nine commercial properties in Pukekohe, Waikato, Hawke's Bay, Horowhenua, and Canterbury was used to validate model outputs. This means that the SVS Tool has been developed to help deal with the specific conditions growers face across New Zealand. To learn more about the research that occurred throughout the SVS Project, check out this video here.

The model behind the SVS Tool is open source (publicly available) and is linked here for those interested: https://github.com/Plant-Food-Research-Open/FieldNBalance.

### What do I do if the crop I want to model isn't available in the tool?

While the project team made every effort to include a wide variety of crops, a line had to be drawn somewhere! First, have a look at Table 1 to see if the crop is there, but listed under a different name (e.g. red beet / beetroot). If your crop isn't there, have a look at the other options to see if there is a crop that behaves very similarly to the crop you'd like to model. For example, broccoflower isn't in the tool, but have a look at the outputs for other head crops, like cauliflower and broccoli, to see if the model outputs are similar to how you manage this crop. Then, make a note in the **Edit comment** pop-up to refer back to**.**

### What information should I input into the tool for different types of rotations with pasture, grass, or animals?

We understand growers run many different types of rotations, often with other farmers who may use the land to graze stock. The table below should help give you an indication of what settings will most accurately reflect your system in the model outputs. To note, specific grass mixes (e.g., clover ryegrass) have not been modelled in the tool – only pasture and ryegrass are available.

| **Situation** | **Crop type / Crop** | **Residue treatment*** | **Target yield** | **Notes** |
|---|---|---|---|---|
| Grazed pasture | Fodder / Pasture | Grazed<br>None removed (grown then sprayed out) | ~ 1 t/ha<br>~ 3 t/ha | A sward stick can be useful to estimate pasture yield under various scenarios. |
| Short rotation grass catch crop (green manure) | Green manure✦ / Annual ryegrass | None removed | 3 t/ha (default) | |
| Grass silage crop | Fodder / Annual ryegrass | None removed, burnt, or grazed | 3 t/ha (default) | For silage crops with multiple cuts, set your crop start date to the start of the final regrowth & enter in final yield, not total yield. |
| Winter grazing followed by closure for silage crop | Fodder / Annual ryegrass | None removed, burnt, or grazed | 3 t/ha (default) | As above – set start date to date paddock closed. |
| Perennial ryegrass crops | Fodder / Annual ryegrass | None removed, burnt or grazed | Likely to be lower than default – see note. | A sward stick can be useful to estimate pasture yield under various scenarios. |

* Residue treatment is for users to indicate what happens to the residue <u>after</u> a crop has been harvested or used for its purpose (i.e., after cut & baling for silage, or grazing).
✦ Ryegrass will be added as a crop option within Green Manure in future updates.

## 7.2 Troubleshooting

### The nitrogen guidance and outputs make no sense.

The nitrogen (N) guidance and outputs have been generated by the SVS Tool model. This model has been developed using both research and grower data from around the country. However, as it is a model, it will make a lot of assumptions and use default values in the background, which may not reflect your crop or conditions. If you are using the tool in Basic level, check out 5 Level: Soil N tests and 6 Level: Crop rotation – these sections have guidance on how to input your own data for fertiliser, soil tests, and prior/next crops. This may result in model outputs that more closely reflect your operation.

A few other things to check if your results aren't looking right:

- Ensure you have entered a sensible *target yield* with t/ha, or an *established population* number if using kg/head (i.e., if modelling a greens crop). If established population is empty when kg/head is selected, the tool won't be able to calculate crop N uptake.
- Ensure you follow the guidance on what soil test results to enter, ensuring the units are correct e.g., add in the raw Nitrate Quick Test results read from the colour chart, not a previously calculated result using another calculator (the tool will do this for you). This could significantly change the recommended guidance.
- Check the soil details you have entered under the soil & environment section. The model outputs may change significantly if under 'Soil category', *sedimentary* is selected instead of *volcanic* (and vice versa).

### Crop N uptake isn't showing up on the Current Crop N Uptake and Soil N graphs

This issue most commonly comes up if 'Established population' is empty when entering a greens crop, with the yield unit set to kg/head. Enter in a population and submit changes – crop N uptake should appear.

### The nitrogen application I just entered isn't showing up in the Nitrogen Schedule.

Have a look at the date of the application you entered – when you first add an N application, the tool will add in today's date (i.e. the day you're using the tool) as the default. If you are modelling a crop scenario from a previous season, then make sure to adjust the date so it lines up with the growing season.

### Changing residue incorporation method makes no impact on my model outputs.

Currently the 'Residue incorporation' inputs section is there as a placeholder for future development. If, for example, you are looking at modelling what happens to soil N levels if you were to bale or incorporate a Prior Crop, then this would not change.

For any other issues, feel free to get in touch with Andrew Barber, andrew@agrilink.co.nz.

# 8 Resources

We have compiled a list of resources below that you may find helpful to refer to as you familiarise yourself with the SVS Tool.

| | |
|---|---|
| Summary of SVS project (May 2024) | https://www.vri.org.nz/dmsdocument/295-sustainable-vegetable-systems-summary-may-2024 |
| SVS project updates<br>• Hosted on PotatoesNZ | https://potatoesnz.co.nz/innovation/research-updates/ |
| Nitrogen soil testing factsheet<br>• Explains what tests to select for each soil lab | https://www.vri.org.nz/dmsdocument/296-nitrogen-soil-testing-factsheet-v6 |
| Nitrate Quick Test information sheet and user guide | https://www.hortnz.co.nz/assets/Compliance/FAR-Quick-Test-Mass-Balance-Guide-2023.pdf |
| VR&I Soil Sampling Guide | https://www.vri.org.nz/dmsdocument/313-vri-soil-sampling-guide-final |
| VR&I Soil Sampling Guide – 1 page quick reference | https://www.vri.org.nz/dmsdocument/314-vri-soil-sampling-guide-1-page-quick-reference |
| Nutrient Management for Vegetable Crops in New Zealand – Reid & Morton | https://www.hortnz.co.nz/assets/Compliance/Nutrient-Management-for-Vegetable-Crops-in-NZ-Manual-Feb-2020.pdf |

**SVS programme videos**

Several short videos are available on the PotatoesNZ YouTube channel to learn more about the SVS programme.

- Introduction & overview: https://www.youtube.com/watch?v=D_UKuYPaScA
- Case studies & monitor sites: https://www.youtube.com/watch?v=Eey5xeqNdBU&t=125s
- The science story: https://www.youtube.com/watch?v=i5hlvxc1AXA&t=9s
- How to perform the nitrate quick test: https://www.youtube.com/watch?v=UrY8yAvtVvY&t=8s

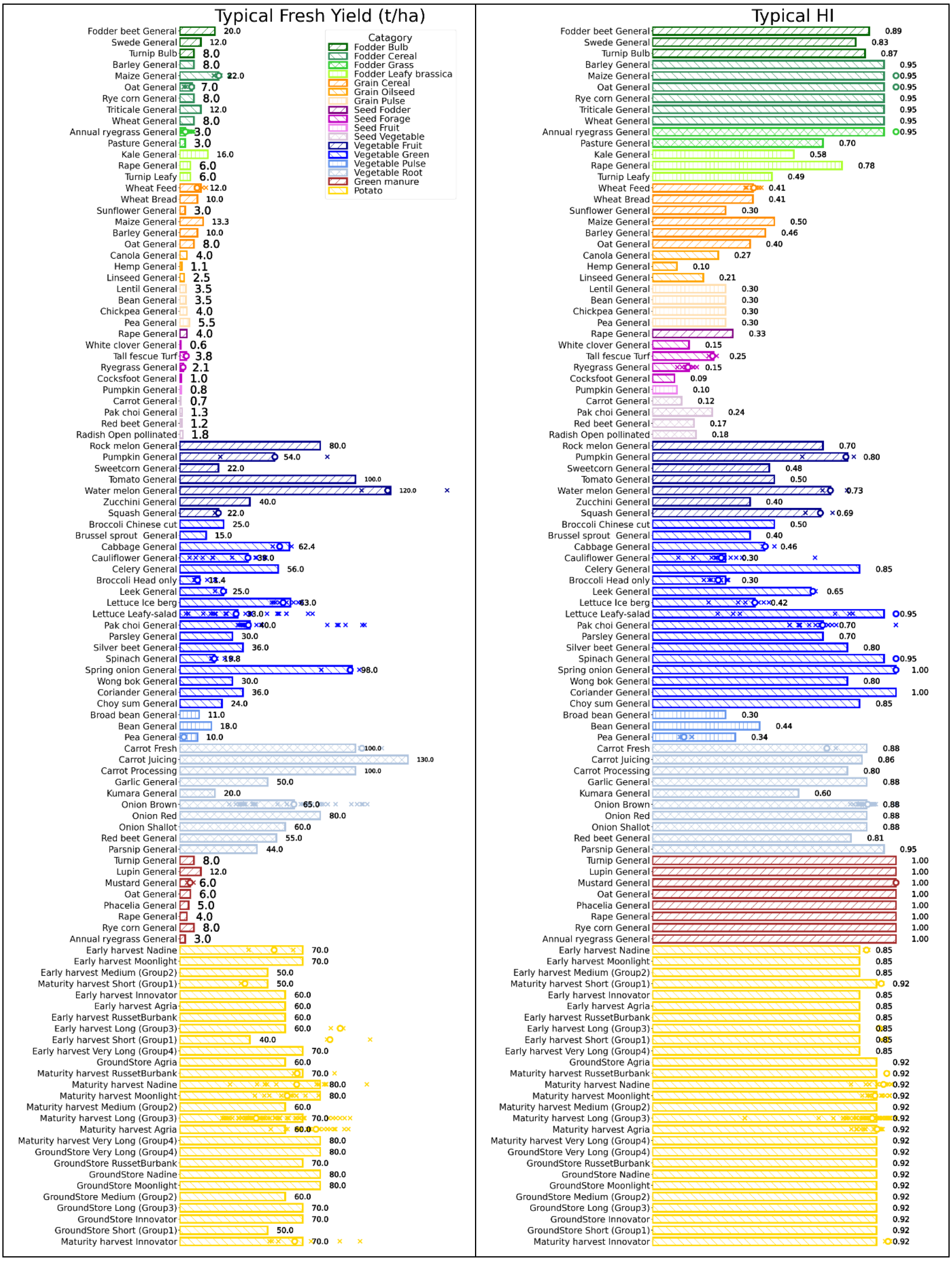
# Appendix 1: Crop inputs reference table

The tool provides 6 categories of crop type to choose from, with a number of crops under each type (Table 1). You can find these crops in the crop information section. For crops that have specific varieties modelled, these have been provided in brackets next to the crop.

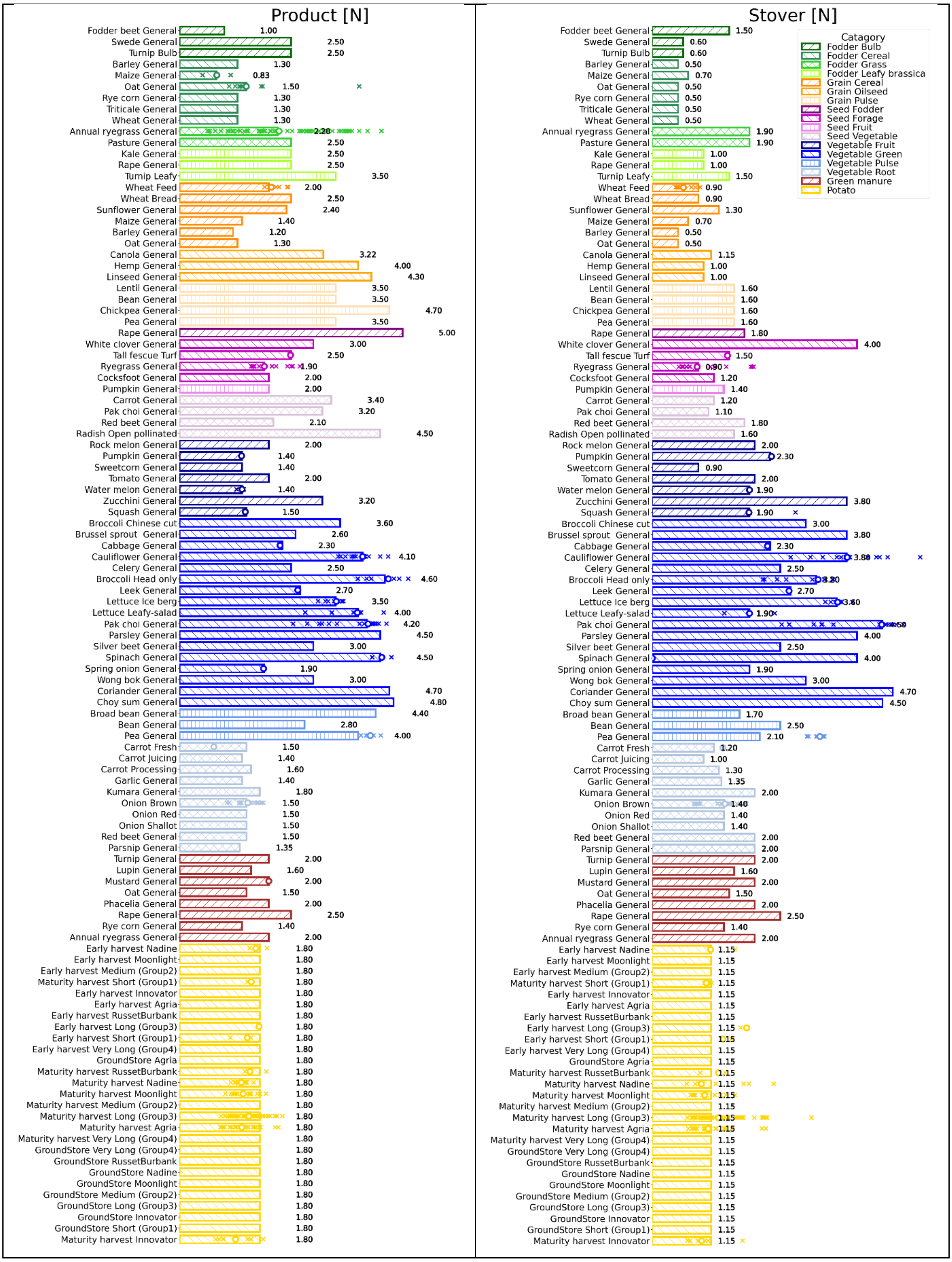
**Table 1.** The crop types, crops, and varieties available to model in the SVS Tool.

| Fodder | Grain | Green manure | Potato | Seed | Vegetable |
|---|---|---|---|---|---|
| Annual ryegrass | Barley | Lupin | Early harvest | Carrot | Bean |
| Barley | Bean | Mustard | Ground store | Cocksfoot | Beetroot – under Red beet |
| Fodder beet | Canola | Oat | Maturity harvest | Pak choi | Broad bean |
| Kale | Chickpea | Phacelia | - Agria | Pumpkin | Broccoli (Chinese cut, head only) |
| Maize | Hemp | Rape | - Innovator | Radish (open-pollinated) | Brussel sprout |
| Oat | Lentil | Rye corn | - Long Group3 | Rape | Cabbage |
| Pasture | Linseed | Turnip | - Medium Group2 | Red beet [beetroot] | Carrot (fresh, juicing, processing) |
| Rape | Maize | | - Moonlight | Ryegrass | Cauliflower |
| Rye corn | Oat | | - Nadine | Tall fescue (turf) | Celery |
| Swede | Pea | | - Russet Burbank | White clover | Choy sum |
| Triticale | Sunflower | | - Short Group1 | | Coriander |
| Turnip (bulb, leafy) | Wheat (bread, feed) | | - Very long Group 4 | | Garlic |
| Wheat | | | | | Kumara |
| | | | | | Leek |
| | | | | | Lettuce (iceberg, leafy salad) |
| | | | | | Onion (red, brown, shallot) |
| | | | | | Pak choi |
| | | | | | Parsley |
| | | | | | Parsnip |
| | | | | | Pea |
| | | | | | Pumpkin |
| | | | | | Red beet [beetroot] |
| | | | | | Rock melon |
| | | | | | Silver beet |
| | | | | | Spinach |
| | | | | | Spring onion |
| | | | | | Squash |
| | | | | | Sweetcorn |
| | | | | | Tomato |
| | | | | | Watermelon |
| | | | | | Wong bok |
| | | | | | Zucchini |

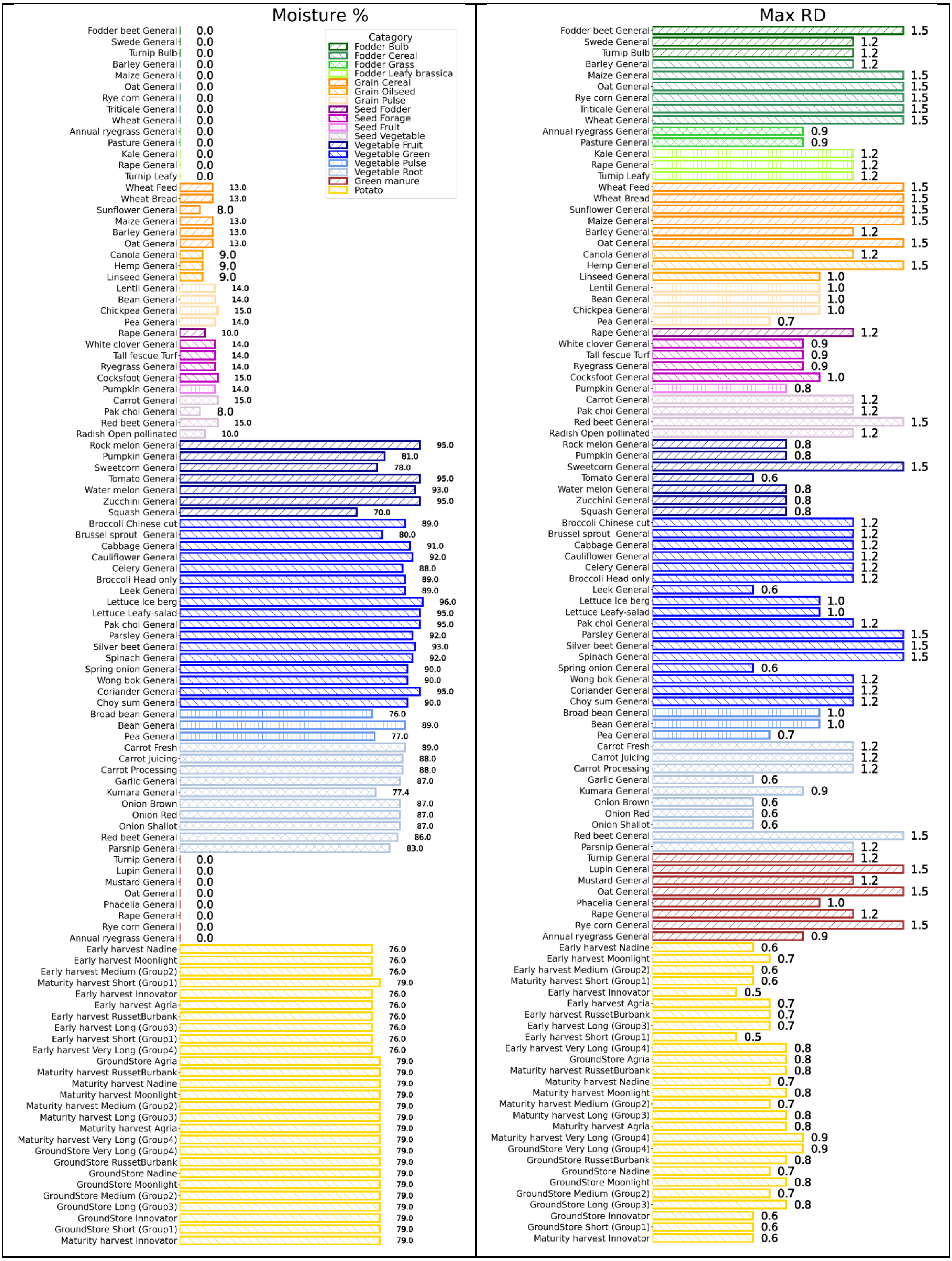
# Appendix 2: Crop coefficients




Typical fresh product yields (t/ha) and harvest index values for crops included in the SVS tool. Where values were measured in SVS they are plotted as a 'x' against the respective crop and the median value of observations is plotted as a 'o'




Nitrogen concentration (% N) in product and stover components for crops included in the SVS tool. Where values were measured in SVS they are plotted as a ‘x’ against the respective crop and the median value of observations is plotted as a ‘o’




Moisture content and maximum rooting depth for crops included in the SVS tool. Note that the SVS Tool models the nitrogen balance in the top 30 cm. The nitrogen below 30 cm is part of the uncharacterised component in the budget. This is an area that has been identified as requiring further investigation, however it is considerably more complex and variable.